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Holocene and Recent shallow soft-bottom mollusks from the northern Gulf of Thailand area: Bivalvia

Elio Robba, Italo Di Geronimo, Niran Chaimanee, Mauro Pietro Negri & Rossana Sanfilippo

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KEY WORDS: Holocene, Recent, mangroves, intertidal, infralittoral, soft-bottom, Bivalvia, Gulf of Thailand.

ABSTRACT: The bivalves recovered from the Holocene Bangkok Clay in the Lower Central Plain of Bangkok along with those obtained from modern shallow bottoms in Phetchaburi coastal area are recorded and described. The bivalve assemblages of the Holocene Bangkok Clay appear to parallel the Recent ones recovered at sea, from intertidal and shallow infralittoral, predominantly muddy, substrates. Arcoidea, Galeommatoidea, Tellinoidea and Veneroidea are the most diverse groups, often with species that occur abundantly. This paper covers 225 species, 35 out of them unidentified and, at least partly, previously undescribed. The species treated are complemented with taxonomic remarks when necessary and with information on respective ecological requirements if available. Except for a few species represented only by fragmented shells, all are illustrated. A list of references to the mollusk fauna of the Indo-Pacific Region is also given in order to provide facilities to the reader.

RIASSUNTO: Vengono passati in rassegna e descritti i bivalvi ottenuti dalla formazione olocenica nota come Bangkok Clay e quelli derivati da campionamenti a mare nell'area costiera di Phetchaburi. Le associazioni di bivalvi della Bangkok Clay riflettono quelle attuali di substrato in prevalenza fangoso. Arcoidea, Galeommatoidea, Tellinoidea e Veneroidea sono i gruppi tassonomici a più elevata diversità specifica, spesso rappresentati da specie con elevati valori di abbondanza. Questo lavoro considera 225 specie, di cui 35 non identificate e, almeno in parte, mai descritte in precedenza. Le descrizioni sono corredate da osservazioni di carattere tassonomico, quando necessarie, e seguite da informazioni sulla ecologia, quando disponibili. Tutte le specie passate in rassegna sono illustrate, tranne alcune rappresentate solo da conchiglie frammentarie. Un elenco bibliografico ampio riguardante i molluschi della regione indo-pacifica viene fornito allo scopo di facilitare il lettore nella ricerca di documentazione.

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INTRODUCTION

The present paper records and describes 225 Holocene and/or Recent bivalve species recovered from the Bangkok Clay and from the shallow sublittoral bottoms at the northwestern corner of the Gulf of Thailand. It is the first in a series devoted to Quaternary and modern mollusk faunas of Thailand, their taxonomic framing, their paleoecological and ecological bearing along with their use for the assessment of the present environmental conditions and conservation. The gastropods and scaphopods from the same areas will be dealt with in a subsequent paper that is being concluded.

The Bangkok Clay is a predominantly clayey unit that was surveyed and intensively sampled at several locations in the Lower Central Plain of Bangkok and in the coastal plain of Phetchaburi as far south as Cha Am (Figs. 1, 2) during the period 1982 through 1996. It yielded very rich and diverse molluskan assemblages whose ^{14}C dates span from 8300±150 years BP to 665±25 years BP. These assemblages denote intertidal and shallow infralittoral inner bay conditions, with local mangrove and fresh water influence, and appear to closely parallel the modern ones recovered at sea from shallow muddy bottoms in Phetchaburi coastal area. For further information on the Bangkok Clay mollusks, reference can be made to CHONGLAKMANI *et al.* (1983), DHEERADILOK *et al.* (1984), SOMBOON (1988) and ROBBA *et al.* (1993).

The work at sea was executed during the years 1996-2000 in the coastal area of Phetchaburi (Figs. 1, 3) southwest of Bangkok at the mouth of Mae Khlong, the second major river in Thailand after the Chao Phraya that flows through Bangkok. The bathymetry and seafloor topography (Fig. 3) are primarily affected by 1) sediment discharge of Mae Khlong, Tha Chin and Chao Phraya rivers, 2) coastal morphology and 3) direction and strength of local winds influencing the longshore drift of sediments. The tidal flat bounded landward by a vast mangrove forest and the shallow infralittoral bottoms appear to be the main physiographic units. The tidal flat stretches continuously along the coastline from Ban Bang Bo southward to Ban Laem Phak Bia where a sand spit bounds it. Further southward, it is replaced by a more or less wide sandy beach which is being actively eroded. The tidal flat spans from 0.3 km at Ban Pak Thale to over 4 km at the Mae Khlong river mouth. The sediment types consist of fine silty sand northeast of the Mae Khlong river mouth and of mud south of that river. The infralittoral zone was investigated to a depth of about 9 m, but some southernmost stations are located between 9 and over 17 m depth. The main feature is represented by a wide valley having its head just seaward of the Khlong Bang Labun and extending eastward approximately 20 km to a depth of 10 m. Both northern and southern slopes deep gently except for the segment at the Mae Khlong mouth that is rather steep. The sediment mainly consists of more or less silty mud with variable proportion of sand. For additional information, refe-

rence is to be made to CHAIMANEE *et al.* (1999).

The Indo-Pacific bivalves have been extensively dealt with during the last two centuries and several basic contributions describing a number of new species were published. More recent comprehensive accounts are those by SATYAMURTI (1956), THANG XI *et al.* (1960), KIRA (1965), CERNOHORSKY (1967, 1972, 1978), HABE (1968), KURODA *et al.* (1971), KAY (1979), BOSCH & BOSCH (1982), SPRINGSTEEN & LEOBRERA (1986), DHARMA (1988, 1992), OLIVER (1992), LAMPRELL & WHITEHEAD (1992), BOSCH *et al.* (1995), LAMPRELL & HEALY (1998) that consider the bivalves of the Red Sea, Arabian Gulf, India, Australia, Indonesia, Philippines, Japan, China and the Pacific Islands.

In comparison, Thai bivalves have received less attention. Except for a basic paper devoted to the material recovered in the Gulf of Thailand during the Danish Expedition 1899-1900 (LYNGE, 1909), only a few other minor contributions were published so far (NIELSEN, 1976 a, b; TANTANASIRIWONG, 1979; SCOTT, 1995). Brackish water species occurring in the mangrove forest and in tidal flats were dealt with by BRANDT (1974). Papers concerning the Holocene mollusks have been already referred to; they consider the paleoecological meaning of species and none of these is described.

The present paper, following that of LYNGE after about one century, aims to offer an up-to-date treatment of the recovered species, based on the critical analysis of the greatest part of the existing literature. In the systematic account, the original publications concerning the recorded species are cited only when actually consulted. The original specimens were examined only in few instances. Except for a few species represented only by fragments, all are illustrated in the plates. A comprehensive bibliography contains references that 1) comprise original descriptions of species, 2) are included in synonymies and 3) provide information on species distribution, both recent and fossil, and on their ecological requirements, with the aim to render the reader well acquainted with Indo-Pacific mollusks.

MATERIALS AND METHODS

The Holocene mollusks were considered at fifteen localities (Fig. 2) where clay pits exposed a variable thickness of the Bangkok Clay. At these locations, the unit was currently bulk sampled, but hand-picking from the outcrops occurred as well in order to collect larger specimens. The material was washed and fossils were separated from their clay or sand matrix using a 1 mm sieve.

The Recent mollusks were obtained at about 120 stations (Fig. 3) covering an area of approximately 800 km² seaward of Phetchaburi coastline, within the tidal flat and shallow infralittoral bottoms down to a maximum depth slightly exceeding 17 m at low tide. The bed of the main tidal channel Khlong Ban Labun and the Mae Khlong river mouth were also considered. The bottom sediment and fauna were generally sampled using a Van Veen grab, but a Charcot-Picard dredge was employed in some instances. The recovered material was washed on board on a 1 mm mesh sieve and the sieve content was preserved in 4% formalin. Further material was hand-picked from the sand spit near the village of Ban Laem Phak Bia; inspection of sun-dried trash-fish near the fishing harbor of this latter village provided several large-sized, nicely preserved shells suitable for species illustration.

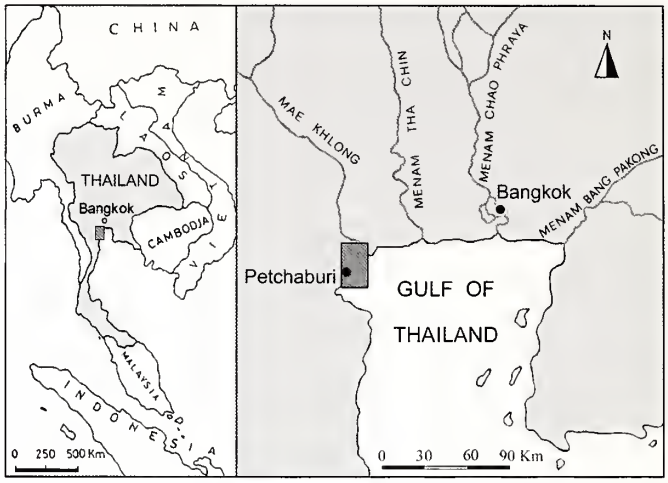

Fig. 1 - Map showing the Lower Central Plain of Bangkok and the Upper Gulf of Thailand; the coastal area of Phetchaburi is evidenced by the rectangle.

All the recovered bivalves have been identified at the species level whenever possible. The systematic order followed is largely that proposed by VAUGHT (1989), with slight modification according to OLIVER (1985) for the family Noetiidae and BRITTON (1972) for some lucinids.

Photographs of shells were taken by digital camera and Scanning Electron Microscope. Photographs have been digitalized by means of computer image analysis software Adobe Photoshop in order to prepare plates.

The work on Thai mollusks being still in progress, the whole material is presently housed in the Dipartimento di Scienze Geologiche e Geotecnologie, University of Milano-Bicocca and, partly, in the Dipartimento di Scienze Geologiche, Sezione di Oceanologia e Paleoecologia, University of Catania.

BRIEF ACCOUNT ON THE BIVALVE ASSEMBLAGES

It is not the aim of the present paper to treat in detail the modern molluscan communities encountered, their corresponding taphocoenoses, nor to describe the fossil assemblages and interpret them in terms of paleoecological meaning. A series of papers concerning these topics is in progress and will be published later. In the following we provide only general information on the broad characters of the molluscan associations, focussing on bivalves.

The mollusk faunas, both fossil and Recent, are usually high-diversity. The bivalves appear to be the dominant element in most cases, with species represented by thousands of specimens. The gastropods are the most diverse taxonomic group, but species are usually low-density. The scaphopods occur uncommonly because of shallow water settings, and are represented by a few species bearing low dominance values.

The fossil assemblages seem to mirror the Recent ones in terms of composition and dominant species and likely are their Holocene counterparts. Preliminary evidence shows that the Holocene transgression brought a very shallow sea onto Thailand's present-day Lower Central Plain where inner bay conditions settled, with clear mangrove and freshwater influence.

As regards Recent mollusks, live specimens occur uncommonly and

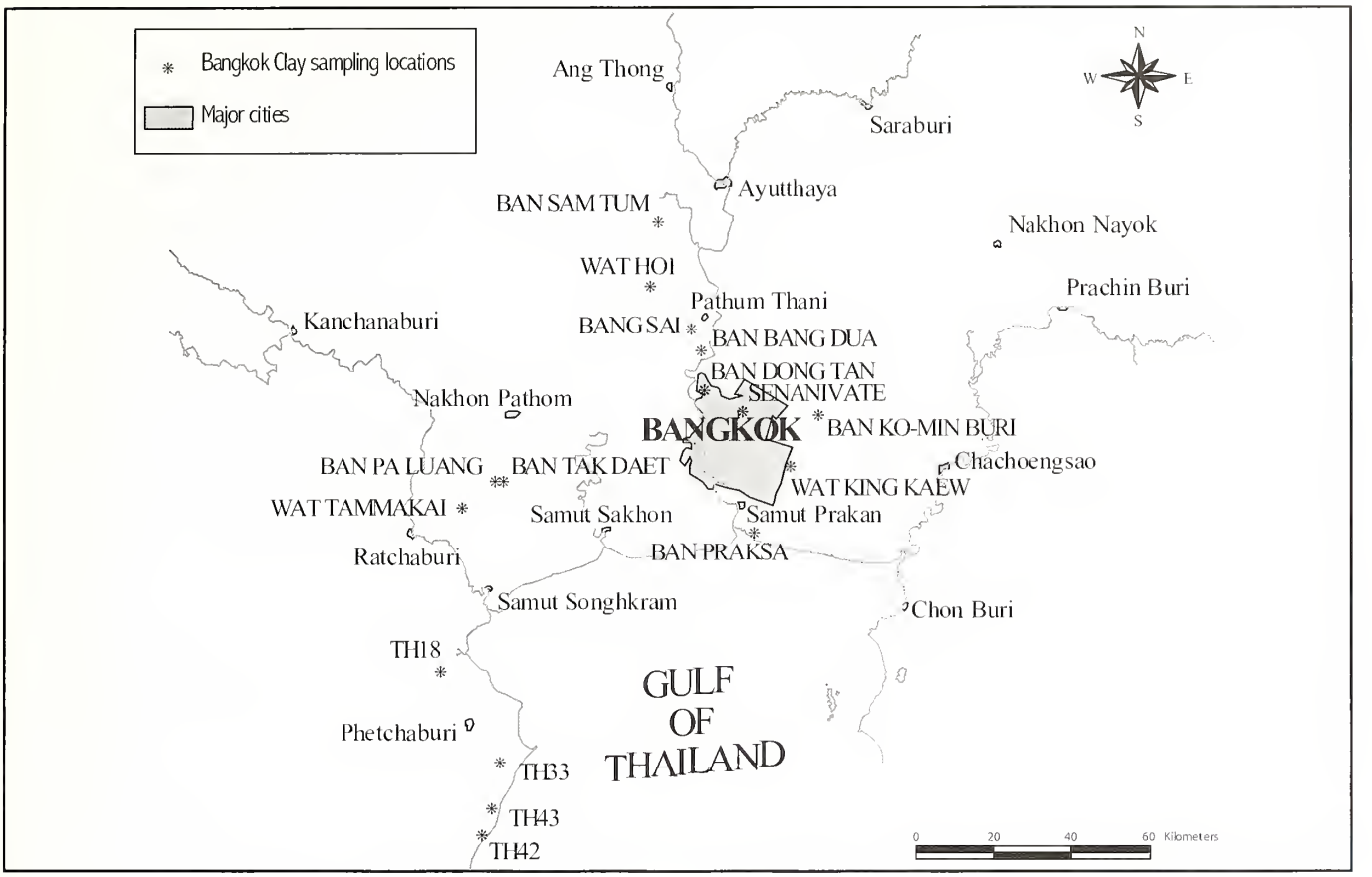

Fig. 2 - Location map of Holocene fossil localities.

species are almost invariably represented by one or few specimens. A rough estimation of diversity is 1-4 species in the intertidal zone, 1-13 in the infralittoral zone. At those stations where live mollusks were recovered in reasonable numbers, bivalves are always more abundant than gastropods. Locally dominant species are *Nucula (Nucula)* sp., *Nuculana (Jupiteria) puellata* (Hinds, 1843), *Nuculana (Scaeoleda) cuspidata* (Gould, 1861), *Pillucina pisidium* (Dunker, 1860), *Chama asperella* Lamarck, 1819, *Theora (Theora) lata* (Hinds, 1843), *Timoclea (Chioneryx) scabra* (Hanley, 1844), *Corbula (Anisocorbula) solidula* Hinds, 1843 and *Corbula (Notocorbula) monilis* Hinds, 1843. It is worthy of note that most of the live specimens are juvenile. *Anadara granosa* (Linnaeus, 1758) and *Pitar (Costellipitar) manillae* (Sowerby, 1851) prevail where the salinity is very low.

Except for a few stations, the modern taphocoenoses are usually very rich in both species and specimens. Among bivalves, Arcoidea, Galeommatoidea, Tellinoidea and Veneroidea are the most diverse taxonomic groups including respectively as many as 22, 30, 42 and 30 species, several of them often co-occurring at the same station. Other rather high-diversity superfamilies are Mytiloidea, Ostreoidea, Lucinoidea and Myoidea.

Nuculana (Jupiteria) puellata (Hinds, 1843), *Timoclea (Chioneryx) scabra* (Hanley, 1844), *Paphia (Paphia) undulata* (Born, 1778), *Dosinia derupta* Römer, 1860 and *Corbula (Notocorbula) monilis* Hinds, 1843 are by far the most common species and bear the greatest abundance values; the former is represented by over 22,000 specimens at some stations. Other significant components of taphocoenoses are *Nucula (Nucula)* sp., *Nuculana (Scaeoleda) cuspidata* (Gould, 1861), *Scapharca inaequivalvis* (Bruguière, 1789), *Scapharca indica* (Gmelin, 1791), *Parvilucina (Bellucina) semperiana* (Issel, 1869), *Pillucina pisidium* (Dunker, 1860), *Vepricardium coronatum* (Spengler, 1799), *Fulvia hungerfordi* (Sowerby, 1901), *Mactra (Mactra) luzonica* Deshayes, 1854, *Raeta (Raetellops) pulchella* (Adams & Reeve, 1850), *Arcopagia pudica* (Hanley, 1844), *Theora (Theora) lata* (Hinds, 1843), *Alveinus ojianus* (Yokoyama, 1927), *Pitar (Costellipitar) manillae* (Sowerby, 1851) and *Corbula (Anisocorbula) solidula* Hinds, 1843 that occur abundantly, but at a moderate number of stations. The considered species are linked to fine-grained substrates, mostly mud with a variable proportion of fine sand.

At those stations where the seafloor is made of shell gravel, dominant species are *Barbatia (Barbatia) foliata* (Forsskål, 1775), *Sheldonella lateralis* (Reeve, 1844), *Striarca symmetrica* (Reeve, 1844), *Septifer bilocularis* (Linnaeus, 1758), *Plicatula (Plicatula) chinensis* Mörch, 1853, *Carditella (Carditellona) pulchella* Lynge, 1909 and *Chama asperella* Lamarck, 1819. *Plicatula chinensis* and *Chama asperella* often occur also with live specimens.

The appendix lists all the recorded species and shows those occurring only as fossils and those recovered only from modern environments.

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SYSTEMATIC ACCOUNT

Class BIVALVIA
Subclass PROTOBRANCHIA
Superfamily NUCULOIDEA
Family *NUCULIDAE*

Nucula (Nucula) sp.
Pl. 1, fig. 2

The species is featured by 1) transversely ovate-triangular, very small shell not exceeding 3 mm in length and 2) faint radial riblets crossed by unevenly spaced growth lines. *Nucula tokyoensis* Yokoyama, 1920, also recorded from the Gulf of Thailand (see SCOTT, 1995), is exceedingly similar in all respects, but differs in that attains a larger size up to 10 mm at least.

FOSSIL RECORDS: Holocene of Thailand.

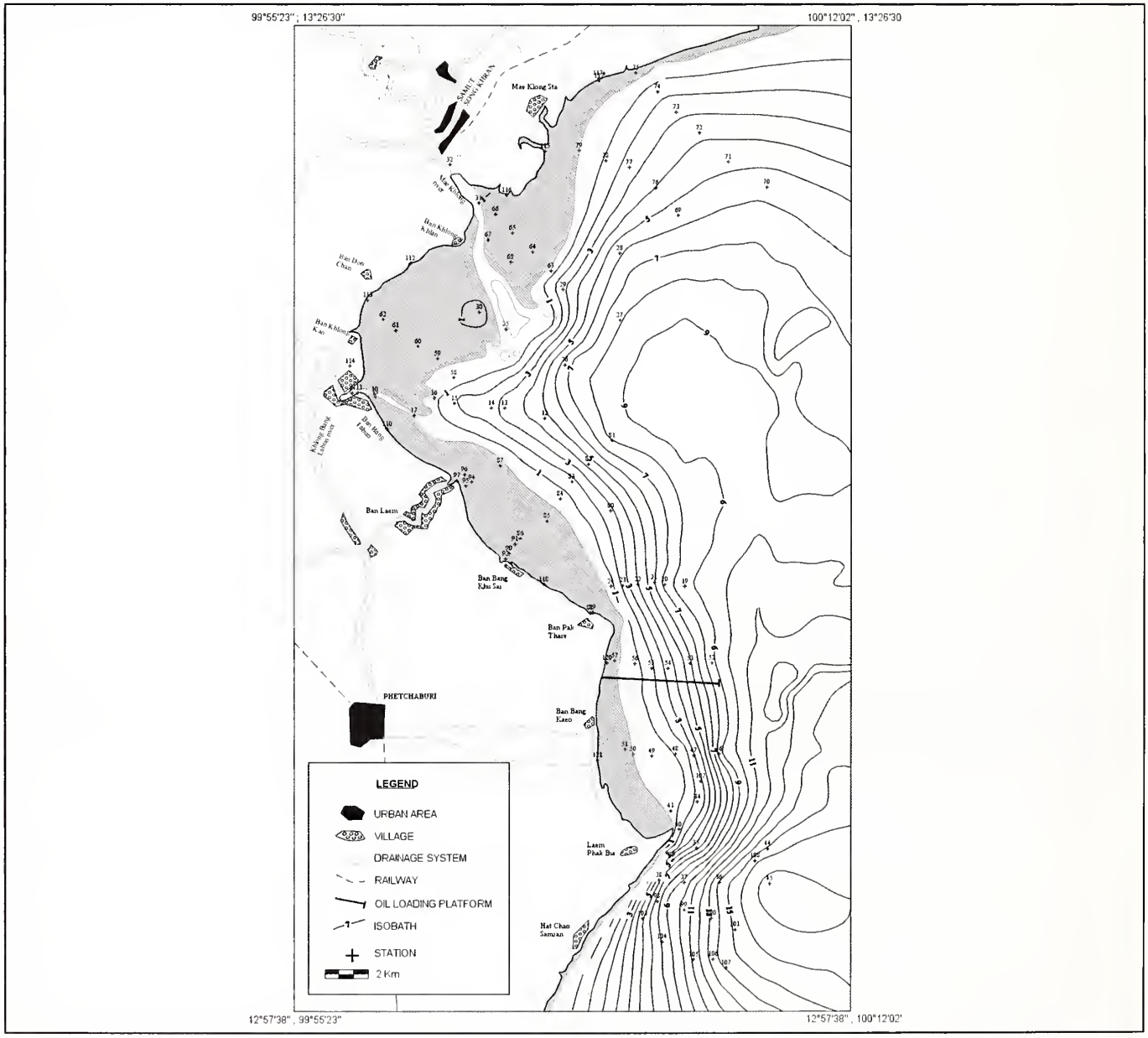

Fig. 3 - Digitalized map of the coastal area of Phetchaburi showing the bathymetric contours, the location of stations at sea and the extension of the tidal flat (shaded).

Nuculoma layardi (Adams, 1856)
Pl. 1, fig. 1

1856 *Nucula layardi* Adams, p. 51.
1909 *Nucula layardi* - Lynge, p. 103.
1995 *Nuculoma layardii* - Bosch, Dance, Moolenbeek & Oliver, p. 203, fig. 899.
1995 *Ennucula* cf. *layardi* Scott, p. 36, fig. in p. 36, middle right.

Nuculoma layardi is featured by 1) elongate-oval, slightly oblique shell up to 15 mm in length, 2) surface smooth except for evenly spaced, low growth markings which are more evident toward the margins and 3) smooth inner margin. *Nucula cumingi* Hinds, 1843 exhibits a quite similar outline, but has a distinct postero-dorsal furrow.
DISTRIBUTION AND HABITAT. The species ranges in the Indo-Malayan Region. Previous records in the Gulf of Thailand were from soft muddy bottoms, from low tide mark to about 10 m (LYNGE, 1909); more recent records were from muddy bottoms 60-70 m deep (SCOTT, 1995).
FOSSIL RECORDS: Holocene of Thailand.

Superfamily NUCULANOIDEA
Family *NUCULANIDAE*
Subfamily *Nuculaninae*

Nuculana (Jupiteria) puellata (Hinds, 1843)
Pl. 1, fig. 4

1843c *Nucula puellata* Hinds, p. 100.
1844 *Nucula puellata* - Hinds, p. 64, pl. 18, fig. 18.
1909 *Nuculana puellata* - Lynge, p. 105.

The figure published by HINDS (1844) is hardly useful. The identification of Thai shells is based on the comparison with the original material in British Museum (Natural History). *Nuculana puellata* has 1) ovate, rather convex small shell not exceeding 8 mm in length, 2) rostrum subacute of variable length and 3) unsculptured shiny surface bearing only faint growth markings.
DISTRIBUTION AND HABITAT. The species ranges from Malay Peninsula to eastern Indonesia. HINDS (1844) recorded it from coarse sand, at depths of from 18 to 30 m. In the Gulf of Thailand it was reported to occur commonly in muddy bottoms at depths of 5-40 m (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Nuculana (Scaeoleda) cuspidata (Gould, 1861)
Pl. 1, fig. 3

1964 *Leda cuspidata* - Johnson, p. 65, pl. 23, fig. 4.

Nuculana cuspidata is characterized by 1) ovate-elongate small shell not exceeding 10 mm in length, 2) pointed, slightly upturned rostrum, 3) shallow anterior radial depression and 4) strong commarginal ridges in the umbonal area then changing into flat, somewhat imbricate low rugae which are more raised on crossing the postero-dorsal keel. *Nuculana bellula* (Adams, 1856) is similarly shaped but has weaker sculpture and lacks the anterior radial depression. *Nuculana puellata* (Hinds, 1843), with which *Nuculana cuspidata* often co-occurs, differs in having somewhat shorter, smooth shell.
DISTRIBUTION AND HABITAT. The species was hitherto known from South China Sea. It occurs in muddy bottoms 10-20 m deep (BERNARD et al., 1993).
FOSSIL RECORDS: Holocene of Thailand (sub *Nuculana bellula*).

Subfamily *Yoldiinae*

Yoldia (Yoldia) belcheri (Hinds, 1843)
Pl. 1, fig. 5

1843c *Nucula belcheri* Hinds, p. 98.
1909 *Nuculana belcheri* - Lynge, p. 104, pl. 1, figs. 18, 19.

Yoldia belcheri is featured by 1) elongate-subelliptical shell up to 15 mm in length, 2) outline with distinct postero-dorsal angulation, 3) short, oblique, nearly straight posterior margin, 4) very weak posterior ridge and 5) sculpture of slightly diagonal, subimbricate commarginal ribbons which tend to vanish at the posterior ridge.
DISTRIBUTION AND HABITAT. The species seems to range from South Africa to Southwest Pacific. Previous records in the Gulf of Thailand consist of a single valve recovered from soft mud at 9 m depth (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Yoldiellinae*

Portlandia japonica (Adams & Reeve, 1850)
Pl. 1, fig. 6

1951 *Portlandia (Portlandella) japonica* - Habe, p. 27, fig. 26.
1959 *Portlandia japonica* - Makiyama, pl. 65, fig. 12.
1965 *Portlandia (Portlandella) japonica* - Kira, p. 119, pl. 42, fig. 11.
1971 *Portlandia (Portlandella) japonica* - Kuroda, Habe & Oyama, p. 322, pl. 66, fig. 12.
1977 *Portlandia (Portlandia) japonica* - Habe, p. 26, pl. 3, fig. 16.
1982 *Portlandia japonica* - Abbott & Dance, p. 290, fig. in bottom row, right.
1988a *Portlandia (Portlandia) japonica* - Noda, p. 65, pl. 16, figs. 14, 20.
1995 *"Portlandia" japonica* - Scott, p. 37, fig. in p. 38, upper left.

Portlandia japonica is featured by 1) elongate-ovate, inflated smooth shell up to 15 mm in length, 2) postero-dorsal blunt angulation and 3) pallial sinus deep nearly reaching midline.
DISTRIBUTION AND HABITAT. The species ranges from the Gulf of Thailand to Japan and Korea. It is reported to dwell in muddy bottoms 10-90 m deep (KIRA, 1965; BERNARD et al., 1993). *Portlandia japonica* has been recorded in the Gulf of Thailand from muddy bottoms at depths of 60-70 m (SCOTT, 1995).
FOSSIL RECORDS: Late Miocene of Japan; Pliocene of Okinawa and Japan.

Subclass PTERIOMORPHIA
Superfamily ARCOIDEA
Family *ARCIDAE*
Subfamily *Arcinae*

Arca (Arca) navicularis Bruguière, 1789
Pl. 1, fig. 7

1847 *Arca navicularis* - Philippi, p. 210, pl. 3, fig. 2.
1885 *Arca navicularis* - Martin, p. 258, pl. 13, fig. 262.
1885 *Arca navicularis* - Smith, p. 259.
1891 *Arca navicularis* - Smith, p. 430.
1907 *Arca (Arca) navicularis* - Lamy, p. 20.
1909 *Arca navicularis* - Lynge, p. 109 (*cum syn.*).
1917a *Arca navicularis* - Lamy, p. 26, 270.
1932 *Arca (Navicula) navicularis* var. *linter* - Prashad, p. 34.
1935 *Arca (Navicula) navicularis* - Oostingh, p. 125, pl. 11, fig. 107.
1937 *Arca navicularis* - Nardini, p. 242, pl. 15, fig. 16.
1939 *Arca (Navicula) navicularis* - Adam & Leloup, p. 39.
1951 *Arca navicularis* - Habe, p. 30, figs. 33-35.
1960 *Arca (Arca) navicularis* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 1, fig. 1.

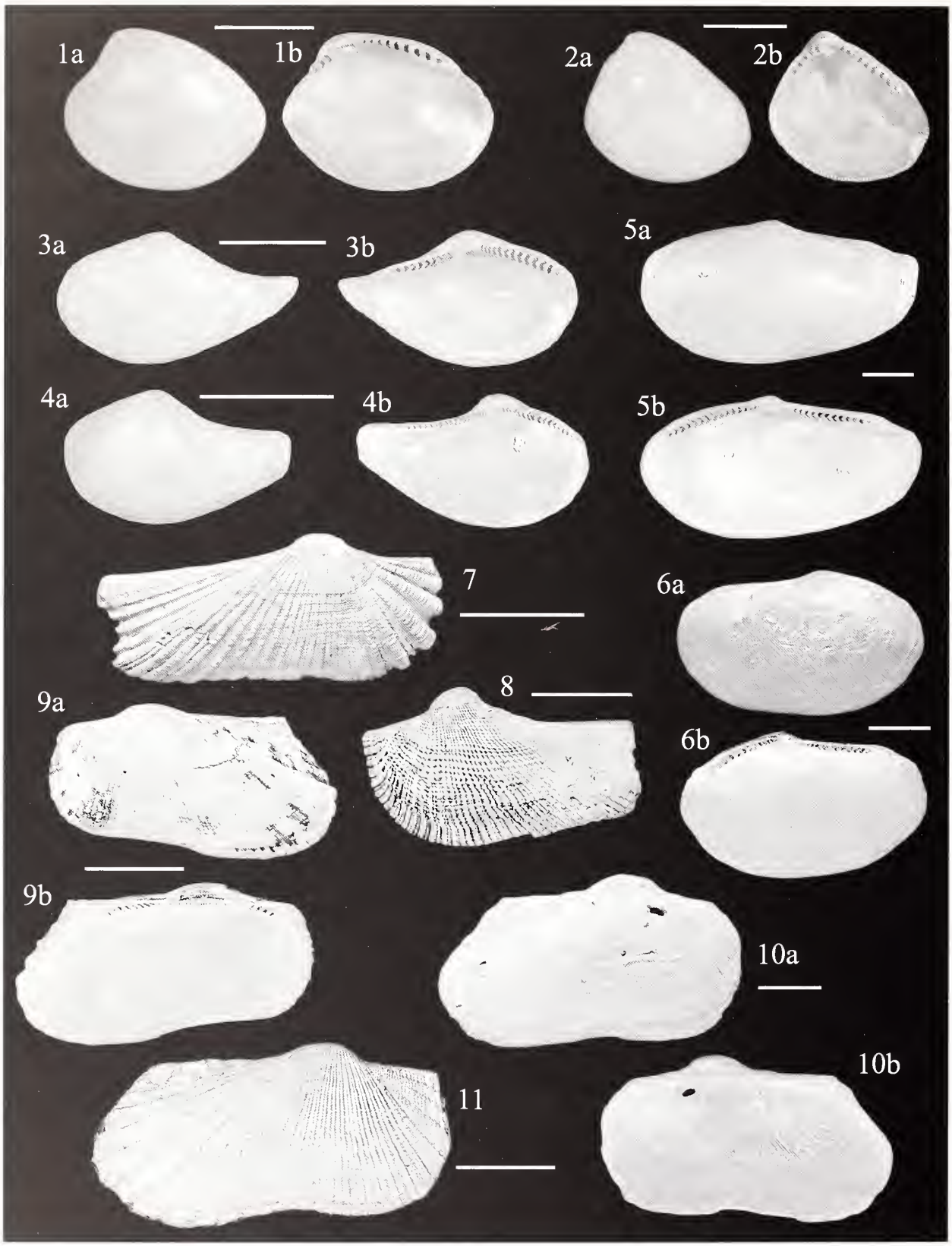

Plate 1: Figs. 1a, 1b. *Nuculoma layardi* (Adams, 1856), Station TH 56; scale bar 1 mm. Figs. 2a, 2b. *Nucula (Nucula)* sp., Station TH 55; scale bar 3 mm. Figs. 3a, 3b. *Nuculana (Scaeoleda) cuspidata* (Gould, 1861), Station TH 98; scale bar 3 mm. Figs. 4a, 4b. *Nuculana (Jupiteria) puellata* (Hinds, 1843), Station TH 55; scale bar 3 mm. Figs. 5a, 5b. *Yoldia (Yoldia) belcheri* (Hinds, 1843), Station TH 9; scale bar 3 mm. Figs. 6a, 6b. *Portlandia japonica* (Adams & Reeve, 1850), Station TH 108; scale bar 3 mm. Fig. 7. *Arca (Arca) navicularis* Bruguière, 1789, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 8. *Arca (Arca)* sp., Station TH 101; scale bar 10 mm. Figs. 9a, 9b. *Barbatia (Barbatia) foliata* (Forsskål, 1775), Station TH 108; scale bar 10 mm. Figs. 10a, 10b. *Barbatia (Barbaia) signata* (Dunker, 1868), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 11. *Hawaiarca histrigata* (Dunker, 1853), Station TH 20; scale bar 10 mm.

1965 *Arca navicularis* - Kira, p. 123, pl. 44, fig. 1.
1966 *Arca (Arca) navicularis* - Noda, p. 58, pl. 2, figs. 1-7.
1971 *Arca navicularis* - Kuroda, Habe & Oyama, p. 326, pl. 67, fig. 13.
1977 *Arca navicularis* - Habe, p. 29, pl. 5, figs. 6, 7.
1978 *Arca navicularis* - Kirtisinghe, p. 17, pl. 3, fig. 1.
1979 *Arca navicularis* - Tantanasiriwong, p. 3.
1982 *Arca navicularis* - Abbott & Dance, p. 291, fig. in bottom row, middle.
1986 *Arca navicularis* - Springsteen & Leobrera, p. 294, pl. 84, fig. 7.
1991 *Arca navicularis* - Abbott, p. 88, pl. 43, fig. 1.
1992 *Arca navicularis* - Oliver, p. 33, pl. 1, fig. 3.
1994 *Arca navicularis* - Oliver & Chesney, pl. 1, figs. 3, 4.
1995 *Arca navicularis* - Kubo & Kurozumi, p. 152, fig. 8.
1996 *Navicula navicularis* - Jansen, p. 38, pl. 3, fig. 146.
1998 *Arca (Arca) navicularis* - Lamprell & Healy, p. 44, fig. 50.

Arca navicularis is easily distinguished by 1) low-elongate, subrectangular shell up to 50 mm in length, 2) beaks at the anterior third, 3) long, straight hinge line and 4) coarse, somewhat noded ribs all over except for the sinus furrow where finer ribs occur. Young specimens lack the posterior wing.

DISTRIBUTION AND HABITAT. The species is widely distributed throughout the tropical Indo-Pacific. It attaches by byssus to hard substrates in the intertidal and infralittoral zones (KIRA, 1965; TANTANASIRIWONG, 1979; BERNARD et al., 1993). Previous records in the Gulf of Thailand were from mixed bottoms 7 to over 60 m deep (LYNGE, 1909).

FOSSIL RECORDS: Pliocene of Indonesia; Quaternary of the Indo-Pacific area. Neogene records need to be confirmed.

Arca (Arca) sp.

Pl. 1, fig. 8

The specimens in hand, up to 20 mm long, recall *Arca navicularis* Bruguière as regards the outline, but exhibits different sculptural features: 1) the ribs are weaker and more numerous, 2) a finer rib occurs in the intervening furrows of the anterior and middle part and 3) raised commarginal ridges form distinct beads on crossing the ribs.

Barbatia (Barbatia) foliata (Forsskål, 1775)

Pl. 1, fig. 9

1885 *Arca (Barbatia) lima* - Smith, p. 260.
1907 *Arca (Barbatia) nivea* - Lamy, p. 59.
1909 *Arca (Barbatia) complanata* - Lynge, p. 111, pl. 1, figs. 5-10.
1932 *Arca (Barbatia) decussata* var. *lima* - Prashad, p. 44.
1964 *Barbatia helblingii* - Spry, p. 9.
1965 *Barbatia lima* - Kira, p. 122, pl. 43, fig. 12.
1968 *Arca (Barbatia) helblingii* - Boshoff & Field, p. 83, pl. 6, fig. e.
1973 *Barbatia nivea* - Selli, p. 166, pl. 1, fig. 5.
1976a *Barbatia helblingi* - Nielsen, p. 2, fig. 4.
1982 *Barbatia helblingi* - Bosch & Bosch, p. 150, mid upper fig.
1984 *Barbatia helblingi* - Sharabati, pl. 38, figs. 10, 10a.
1989 *Barbatia helblingi* - Bosch & Bosch, p.79, middle fig.
1990 *Barbatia helblingi* - Wells, Bryce, Clark & Hansen, p. 77, pl. 74, fig. 336.
1991 *Barbatia velata* - Abbott, p. 89, pl. 42, fig. 6.
1992 *Barbatia foliata* - Oliver, p. 35, pl. 2, fig. 1 (*cum syn.*).
1995 *Barbatia foliata* - Kubo & Kurozumi, p. 152, fig. 2.
1996 *Barbatia foliata* - Bosch, Dance, Moolenbeek & Oliver, p. 207, fig. 911.
1996 *Barbatia helblingi* - Jansen, p. 37, pl. 3, fig. 141.
1998 *Barbatia (Barbatia) foliata* - Lamprell & Healy, p. 46, fig. 54.

Barbatia foliata is herein intended according to OLIVER (1992). It is characterized by 1) large size attaining 120 mm, 2) subrectangular to subtrigonal outline, 3) slight posterior wing and 4) dense, narrow, nodulose riblets. *Barbatia decussata* (Sowerby, 1833) is the most closely related species differing in that lacks the posterior wing and has the ribs devoid of nodes (OLIVER, 1992). It is of note that the name *helblingi* Bruguière, 1792 applies to a western Atlantic species.

DISTRIBUTION AND HABITAT. *Barbatia foliata* ranges from the Red Sea eastward to Australia and northward to Japan. It is an intertidal and infralittoral element attached by byssus to hard substrates. Former records in Thai waters were from stones, coral blocks, occasionally from mud in the bathymetric interval 0-30 m (LYNGE, 1909 sub *Barbatia complanata*; TANTANASIRIWONG, 1979 sub *Barbatia helblingi*).

FOSSIL RECORDS: Quaternary of the Red Sea and Gulf of Aden.

Barbatia (Barbatia) signata (Dunker, 1868)

Pl. 1, fig. 10

1868 *Arca signata* Dunker, p. 112, pl. 38, figs. 3-5.
1907 *Arca (Barbatia) signata* - Lamy, p. 78, pl. 1, figs. 1, 2.
1909 *Arca signata* - Lynge, p. 110, pl. 1, figs. 14, 15.

Barbatia signata is featured by 1) subrectangular-elongate shell, 2) ribs distinctly beaded, constantly grooved except for the most postero-dorsal ones, 3) anterior and middle ribs bifurcated and 4) posterior ribs bearing 2-3 grooves. The species superficially resembles *Hawaiarca bistrigata* (Dunker, 1853) but is differently sculptured (see below for comparison).

DISTRIBUTION AND HABITAT. *Barbatia signata* is distributed from eastern Indian Ocean to China Sea. According to BERNARD et al. (1993), it dwells on intertidal rocks. Previous records in the Gulf of Thailand were from hard substrates (shell gravel, stones) 18-54 m deep (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Hawaiarca bistrigata (Dunker, 1853)

Pl. 1, fig. 11

1853 *Arca bistrigata* Dunker, p. 87, pl. 30, figs. 4-6.
1885 *Arca bistrigata* - Martin, p. 256, pl. 13, fig. 260.
1907 *Arca (Barbatia) bistrigata* - Lamy, p. 77.
1951 *Nipponarca bistrigata* - Habe, p. 35, fig. 49.
1977 *Nipponarca bistrigata* - Habe, p. 33, pl. 5, fig. 21.
1968 *Nipponarca bistrigata* - Habe, p. 164, pl. 49, fig. 11.
1978 *Arca bistrigata* - Kirtisinghe, p. 18, pl. 3, fig. 5.
1983 *Barbatia bistrigata* - Chonglakmani, Ingavat, Piccoli & Robba, p. 345, pl. 2, fig. 2 (1-3).
Not 1984 *Barbatia* cf. *bistrigata* Sharabati, pl. 38, fig. 2.
1986 *"Nipponarca" bistrigata* - Noda, p. 68, pl. 3, figs. 14, 16, 17.
1990 *Nipponoarca bistrigata* - Noda & Sato, pl. 1, fig. 20.
1998 *Barbatia (Nipponarca) bistrigata* - Lamprell & Healy, p. 44, fig. 53.

Hawaiarca bistrigata is readily distinguished on account of 1) subrectangular-elongate shell up to 40 mm in length, 2) shallow but distinct sinus furrow, 3) bifurcated ribs on the mid-anterior part and 4) wide, flat topped posterior ribs. The Pliocene Okinawan *Hawaiarca uwaensis* (Yokoyama, 1928) is closely related but differs in having higher posterior part and oblique ventral margin.

DISTRIBUTION AND HABITAT. The species ranges from India to Korea and Japan. *Barbatia bistrigata* was reported to occur in sand and gravel at depths of 20-50 m (BERNARD et al., 1993). According to HABE (1968), it is usually found attached to rocks by byssus below the low tide mark in the inner part of bays.

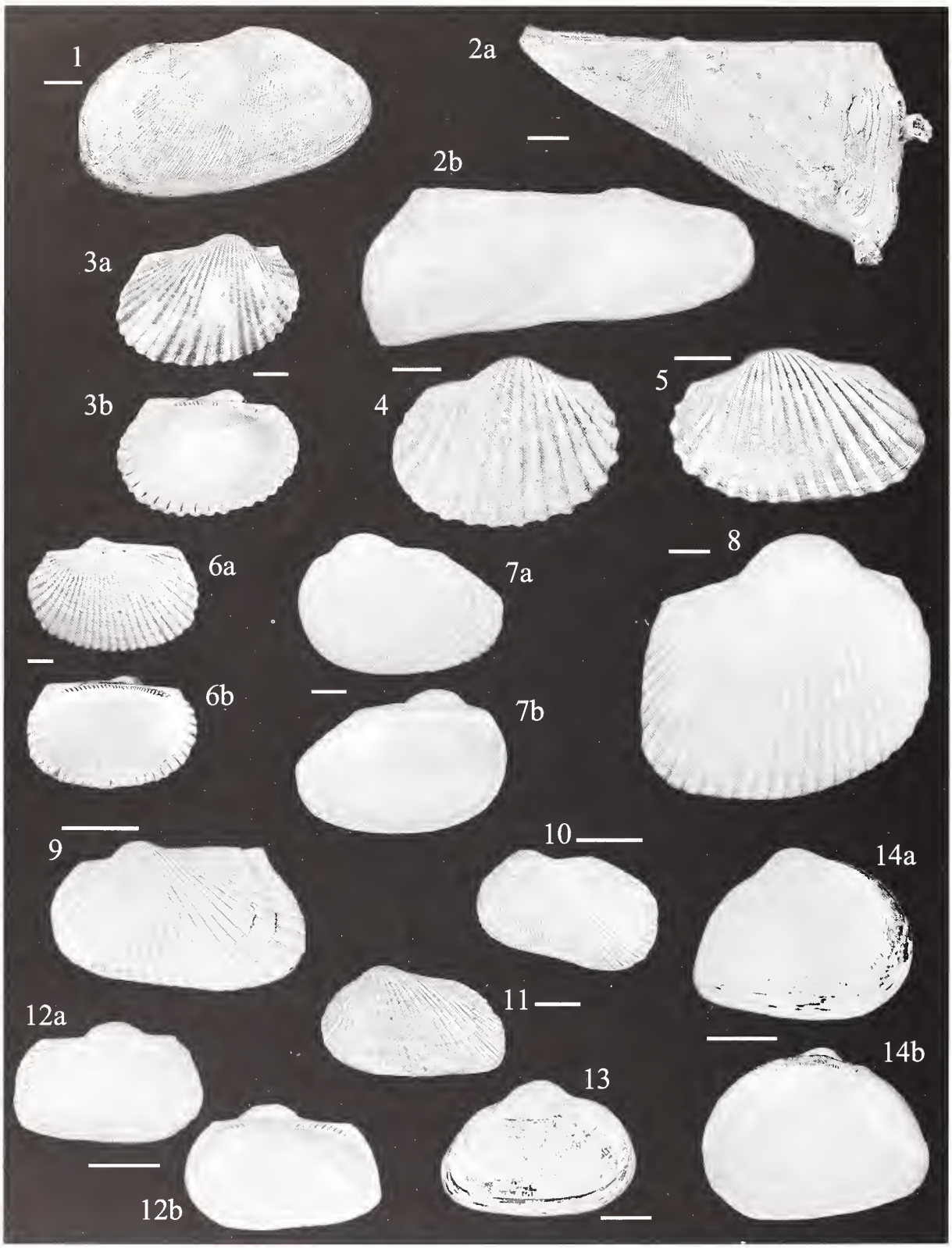

Plate 2: Fig. 1. *Trisidos semitorta* (Lamarck, 1819), trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Figs. 2a, 2b. *Trisidos tortuosa* (Linnaeus, 1758), trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Figs. 3a, 3b. *Anadara ferruginea* (Reeve, 1844), Station TH 53; scale bar 1 mm. Fig. 4. *Anadara granosa* (Linnaeus, 1758), Station TH 11; scale bar 10 mm. Fig. 5. *Anadara oblonga* (Philippi, 1849), Station TH 15; scale bar 10 mm. Figs. 6a, 6b. *Anadara* sp., Station TH 8; scale bar 1 mm. Figs. 7a, 7b. *Scapharca crebricostata* (Reeve, 1844), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 8. *Scapharca inaequivalvis* (Bruguière, 1789), trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Fig. 9. *Scapharca indica* (Gmelin, 1791), Station TH 79; scale bar 10 mm. Fig. 10. *Sheldonella lateralis* (Reeve, 1844), Station TH 20; scale bar 10 mm. Fig. 11. *Didimacar tenebrica* (Reeve, 1844), Ban Tak Daet, level BTD 2, Holocene; scale bar 3 mm. Fig. 12a, 12b. *Striarca symmetrica* (Reeve, 1844), Station TH 108; scale bar 3 mm. Fig. 13. *Estellacar olivacea* (Reeve, 1844), Station TH11; scale bar 5 mm. Figs. 14a, 14b. *Scelidionarca pectunculiformis* (Dunker, 1866), sand spit near Ban Laem Phak Bia; scale bar 10 mm.

FOSSIL RECORDS: Late Miocene to Quaternary of Southeast Asia and Japan; Holocene of Thailand.

Trisidos semitorta (Lamarck, 1819)

Pl. 2, fig. 1

1907 *Arca (Parallelepipedum) semitorta* - Lamy, p. 109.
1909 *Arca (Trisidos) semitorta* - Lynge, p. 127.
1939 *Trisidos semitorta* - Mukerjee, p. 24, pl. 1, fig. 19.
1960 *Arca (Parallelepipedum) semitorta* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 8, fig. 7.
1965 *Trisidos (Epitrisis) semitorta* - Kira, p. 123, pl. 44, fig. 3.
1971 *Trisidos semitorta* - Shuto, p. 9, pl. 4, fig. 17.
1978 *Trisidos semitorta* - Popenoe & Kleinpell, pl. 13, fig. 163.
1979 *Trisidos semitorta* - Tantanasiriwong, p. 4.
1982 *Trisidos semitorta* - Abbott & Dance, p. 294, fig. in upper middle row, left.
1982 *Trisidos semitorta* - Kanno, O'Hara & Caagusan, p. 57, pl. 14, figs. 5, 6.
1986 *Trisidos semitorta* - Springsteen & Leobrera, p. 294, pl. 84, fig. 6.
1988 *Trisides semitorta* - Tsuchida, pl. 1, fig. 6.
1996 *Trisidos semitorta* - Jansen, p. 38, pl. 3, fig. 149.
1998 *Trisidos semitorta* - Lamprell & Healy, p. 52, fig. 75.

Trisidos semitorta is featured by 1) elongate-oval, somewhat twisted shell up to 100 mm in length, 2) left valve with distinct, blunt posterior umbonal ridge and 3) sculpture of numerous, fine radial riblets and commarginal threads in the furrows between riblets.

DISTRIBUTION AND HABITAT. The species is distributed in the eastern Indian and Southwest Pacific oceans, from the Gulf of Aden to Australia and northward to Japan. *Trisidos semitorta* is reported to dwell on sublittoral bottoms to 180 m depth (KIRA, 1965). Most common occurrences are between the low tide mark and 70 m on mud, sand, shell sand and gravel (LYNGE, 1909; TANTANASIRIWONG, 1979; BERNARD et al., 1993).

FOSSIL RECORDS: Late Oligocene of India and Indonesia; Early Miocene of India, Myanmar and Indonesia; Mid-Late Miocene of Indonesia and Philippines; Pliocene of Indonesia and Philippines; Quaternary of the Indo-Pacific area.

Trisidos tortuosa (Linnaeus, 1758)

Pl. 2, fig. 2

1858 *Parallelepipedum tortuosum* - Adams & Adams, p. 539, pl. 125, figs. 4, 4a.
1889 *Arca tortuosa* - Crosse & Fischer, p. 291.
1907 *Arca (Prallelepipedum) tortuosa* - Lamy, p. 108.
1909 *Arca (Trisidos) tortuosa* - Lynge, p. 127.
1917a *Arca (Parallelepipedum) tortuosa* - Lamy, p. 34.
1951 *Trisidos tortuosa kiyonoi* - Habe, p. 35, fig. 54.
1956 *Arca tortuosa* - Satyamurti, p. 26, pl. 3, fig. 1.
1960 *Arca (Parallelepipedum) tortuosa* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 7, fig. 6.
1961 *Trisidos (Trisidos) tortuosa kiyonoi* - Hayasaka, p. 25, pl. 2, fig. 7.
1965 *Trisidos tortuosa kiyonoi* - Kira, p. 123, pl. 44, fig. 4.
1966 *Trisidos kiyonoi* - Noda, p. 77, pl. 3, figs. 1-3, 13.
1969 *Trisidos tortuosa* - Treatise I. P., p. N254, fig. C 3 (3).
1975 *Trisidos tortuosa* - Oliver, p. 300, fig. in front page, middle left.
1977 *Trisidos kiyonoi* - Habe, p. 33, pl. 6, fig. 1.
1978 *Trisidos tortuosa* - Kirtisinghe, p. 22, pl. 9, fig. 1.
1981 *Arca (Trisodos) tortuosa* - Eisenberg, p. 155, pl. 137, fig. 9.
1982 *Trisidos tortuosa* - Abbott & Dance, p. 294, fig. in upper middle row, middle.
1991 *Trisidos tortuosa* - Abbott, p. 90, pl. 42, fig. 5.
1992 *Trisidos tortuosa* - Oliver, p. 37, pl. 1, fig. 7.
1992 *Trisidos tortuosa* - Dharma, p. 80, pl. 18, fig. 6.
1995 *Trisidos tortuosa*- Bosch, Dance, Moolenbeek & Oliver, p. 209, fig. 919.
1996 *Trisidos tortuosa* - Jansen, p. 38, pl. 3, fig. 150.
1998 *Trisidos tortuosa* - Lamprell & Healy, p. 52, fig. 74.

Trisidos tortuosa differs from *Trisidos semitorta* in that has 1) elongate-subtriangular, markedly twisted shell up to 100 mm in length, 2) left valve with sharp posterior umbonal keel and 3) sculpture obsolescent over the flat postero-dorsal area of the left valve.

DISTRIBUTION AND HABITAT. The species ranges in the Indian Ocean and Southwest Pacific Ocean, from the Red Sea to Queensland and northward to Japan. *Trisidos tortuosa* is reported to dwell on different substrates (mud, sand, gravel) from the intertidal zone down to 50 m depth (KIRA, 1965; BERNARD et al., 1993). In the Gulf of Thailand the species occurs infralittorally on mud or sandy mud (LYNGE, 1909).

FOSSIL RECORDS: ? Early-Mid Miocene of Indonesia; Late Miocene of Indonesia; Pliocene of Indonesia, Taiwan and Japan; Quaternary of the Indo-Pacific area.

Subfamily *Anadarinae*

Anadara ferruginea (Reeve, 1844)

Pl. 2, fig. 3

1844a *Arca ferruginea* Reeve, p. 43.
1907 *Arca (Anadara) ferruginea* - Lamy, p. 231.
1922 *Arca ferruginea* - Dickerson, pl. 6, fig. 3.
1924 *Anadara ferruginea* - Cossmann, p. 93, pl. 4, figs. 19-22.
1971 *Anadara (Anadara) ferruginea* - Shuto, p. 18, pl. 2, figs. 10, 13, 15, 16; text fig. 4.
1977 *Diluvarca ferruginea* - Habe, p. 37, pl. 8, fig. 1.
1979 *Anadara (Scapharca) ferruginea* - Noda, pl. 37, figs. 1, 2, 4, 10, 14.
1981 *Anadara (Diluvarca) ferruginea* - Poutiers, p. 329.
1984 *Anadara (Anadara) ferruginea* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 417, pl. 2, figs. 1, 2.
1988b *Arca ferruginea* - Noda, pl. 4, fig. 1.
1989 *Diluvarca ferruginea* - Ito, p. 58, pl. 18, fig. 14.
1994 *Anadara ferruginea* - Scott, p. 59, pl. 1, fig. D.
1995 *Diluvarca ferruginea* - Scott, p. 38, fig. in same page.
1998 *Anadara (Cunearca) ferruginea* - Lamprell & Healy, p. 58, fig. 91.

Anadara ferruginea is characterized by 1) oval, slightly elongated shell attaining about 40 mm in length and 2) sculpture of 24-26 radial ribs angular in cross section, topped with small granules in the early growth stages and broader than the flat intervening spaces.

DISTRIBUTION AND HABITAT. The species ranges from Southeast Asia to southern Japan usually occurring on fine sandy or muddy bottoms at depths of 5-120 m (POUTIERS, 1981; BERNARD et al., 1993). On the west coast of peninsular Thailand it was trawled from a muddy bottom 30 m deep (TANTANASIRIWONG, 1979); recent records in the Gulf of Thailand are from muddy bottoms 60-70 m deep (SCOTT, 1995).

FOSSIL RECORDS: Late Middle Miocene of Indonesia; Pliocene of India, Indonesia and Philippines; Holocene of Thailand.

Anadara granosa (Linnaeus, 1758)

Pl. 2, fig. 4

1907 *Arca (Anadara) granosa* - Lamy, p. 210.
1909 *Arca (Anadara) granosa* - Lynge, p. 118.
1922 *Arca granosa* - Dickerson, pl. 6, fig. 4.
1932 *Arca (Anadara) granosa* - Prashad, p. 36.
1954 *Anadara (Tegillarca) granosa* - Taki & Oyama, pl. 35, fig. 4.
1960 *Arca (Anadara) granosa* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 11, fig. 9.
1960 *Anadara granosa* - Makiyama, pl. 103, fig. 1.
1966 *Anadara (Tegillarca) granosa* - Noda, pl. 14, figs. 5-7.
1969 *Anadara granosa* - Narasimham, p. 407, pl. 1, fig. 1.
1977 *Tegillarca granosa* - Habe, p. 38, pl. 8, fig. 5.

1978 *Anadara granosa* - Popenoe & Kleinpell, pl. 12, figs. 157-159.
1978 *Anadara granosa* - Kirtisinghe, p. 23, pl. 9, fig, 5.
1980 *Tegillarca granosa* - Wu Wen-lung, p. 102, pl. 1, fig. B.
1982 *Anadara granosa* - Abbott & Dance, p. 293, fig. in top row, left.
1986 *Anadara (Tegillarca) granosa* - Springsteen & Leobrera, p. 302, pl. 86, fig. 7.
1986 *Tegillarca granosa* - Takayasu, pl. 80, fig. 17.
1986 *Anadara granosa* - Lan Xiu, pl. 2, fig. 8.
1990 *Anadara (Tegillarca) granosa* - Noda & Sato, pl. 2, fig. 5.
1991 *Anadara granosa* - Abbott, p. 89, pl. 44, fig. 3.
1992 *Anadara granosa* - Dharma, p. 80, pl. 18, fig. 2.
1998 *Anadara (Tegillarca) granosa* - Lamprell & Healy, p. 54, fig. 78.

The species is readily recognized on the basis of 1) ovate-rectangular, robust shell up to 80 mm in length, 2) swollen umbonal area and 3) sculpture of 19-20 strongly noded radial ribs.

DISTRIBUTION AND HABITAT. *Anadara granosa* is a common species, ranging from India to eastern Indonesia and northward as far as southern Japan. It is a mud dweller living on the seaward fringe of the mangrove forest, in bare tidal flats, channels and embayments, but may be found within the mangal as well (TANTANASIRIWONG, 1979; MORTON, 1983; PLAZIAT, 1984; BERNARD et al., 1993). According to PURCHON & PURCHON (1981), the species occurs widely in regions of mangrove on sheltered shores, especially along the west coast of peninsular Malaya; it dwells soft, shallow sublittoral muds at and below low water mark of neap tides, lying at the surface of the mud. In the estuarine waters of Porto Novo (India), when the salinity is higher than average, as in summer months, *Anadara granosa* migrates higher up in the estuary, but during the floods it migrates in more saline waters. In the estuary, where diurnal and seasonal variations, particularly in salinity and temperature prevail, the feeding rate of the bivalve may be expected to show corresponding variations (KRISHNAMURTHY & RAMAMURTHY, 1989). These authors have noted that the feeding rate increased with salinity even if not uniformly; it is directly related to temperature as well, but declines when the temperature exceeds 30° C.

FOSSIL RECORDS: Late Miocene of Indonesia and Philippines; Pliocene of Indonesia, Philippines, Taiwan and Japan; Quaternary of Southeast Asia, Taiwan and Japan; Holocene of Thailand.

Anadara oblonga (Philippi, 1849)

Pl. 2, fig. 5

1849 *Arca oblonga* Philippi, p. 85, pl. 5, fig. 6.
1885 *Arca oblonga* - Martin, p. 243, pl. 12, fig. 248.
1909 *Arca (Anadara) oblonga* - Lynge, p. 118.
1933 *Arca (Arca) nodifera* - Nomura, p. 36, pl. 4, fig. 15.
1965 *Anadara (Tegillarca) nodifera* - Kira, p. 123, pl. 44, fig. 6.
1966 *Anadara (Tegillarca) nodifera* - Noda, p. 126, pl. 1, fig. 10.
1982 *Anadara (Tegillarca) nodifera* - Kanno, O'Hara & Caagusan, p. 60, pl. 14, fig. 2.

Anadara oblonga is featured by 1) elongate-ovate, relatively small-sized shell and 2) 19-22 narrow, minutely noded ribs. *Anadara granosa* is a related species attaining a larger size and differing in that has 1) higher shell, 2) more arched ventral margin and 3) strongly noded ribs.

DISTRIBUTION AND HABITAT. *Anadara oblonga* ranges from Thailand to the Philippines and Taiwan, usually occurring intertidally and down to 10 m depth in mud and sand (BERNARD et al., 1993). In the Gulf of Thailand it was recorded very common from soft muddy or shell bottoms at depths of 5-20 m (LYNGE, 1909). MORTON (1983) reported the species (sub *Anadara nodifera*) to occur in mud in a Phuket mangrove but not within the mangal proper.

FOSSIL RECORDS: Late Miocene of Indonesia and ? Philippines; Pliocene of Indonesia, Taiwan and ? Japan; Quaternary of Indonesia, Thailand and Taiwan; Holocene of Thailand.

Anadara sp.

Pl. 2, fig. 6

A single left valve 6.5 mm long is in hand, featured by 1) oval-subrectangular outline, 2) beak slightly anterior to mid-line, 3) anterior and posterior margins arched, the former more so and 4) sculpture of 32 radial ribs somewhat wider than the intervening furrows, overridden by rough commarginal threads which are more prominent on crossing the ribs.

FOSSIL RECORDS: Holocene of Thailand.

Scapharca crebricostata (Reeve, 1844)

Pl. 2, fig. 7

1844a *Arca crebricostata* Reeve, p. 46.
1907 *Arca (Anadara) crebricostata* - Lamy, p. 253.
1909 *Arca (Scapharca) crebricostata* - Lynge, p. 123.
1998 *Anadara (Scapharca) crebricostata* - Lamprell & Healy, p. 56, fig. 82.

The species is recognized by 1) elongate, transversely subquadrangular, inequilateral shell up to 75 mm in length, 2) anterior margin broadly rounded, posterior one nearly straight, rather gently sloping, forming an obtuse angle with the ventral margin, 3) beaks at the anterior one-fourth, 4) sculpture of 45 low, flat-topped radial ribs, wider than the intervening spaces, bisected by a longitudinal faint median groove on the mid-distal part. The Thai specimens are close to *Arca fultoni* Sowerby, 1907 in having the ribs wider than their interspaces. Sowerby's taxon has been synonymized to the present species. *Scapharca vellicata* (Reeve, 1844) differs in that has sharp posterior keel.

DISTRIBUTION AND HABITAT. *Scapharca crebricostata* ranges from the Gulf of Thailand northward to South China Sea. According to BERNARD et al. (1993), it dwells on muddy substrates, from low tide mark to 5 m depth. LAMPRELL & HEALY (1998) recorded the species from eel grasses in littoral areas. Previous records in the Gulf of Thailand were from littoral sand (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Scapharca inaequivalvis (Bruguière, 1789)

Pl. 2, fig. 8

1858 *Scapharca inaequivalvis* - Adams & Adams, p. 538, pl. 125, figs. 3, 3a.
1885 *Arca inaequivalvis* - Martin, p. 250, pl. 13, fig. 254.
1907 *Arca (Anadara) inaequivalvis* - Lamy, p. 256.
1909 *Arca (Scapharca) rhomboidalis* - Lynge, p. 122.
1956 *Arca inaequivalvis* - Satyamurti, p. 24, pl. 2, fig. 7.
1977 *Scapharca inaequivalvis* - Habe, p. 37, pl. 7, fig. 7.
1968 *Scapharca inaequivalvis* - Habe, p. 164, pl. 49, fig. 17.
1968 *Arca inaequivalvis* - Cheriyan, p. 127.
1969 *Scapharca (Scapharca) inaequivalvis* - Treatise I. P., p. N256, fig. C5 (6).
1971 *Scapharca inaequivalvis* - Kuroda, Habe & Oyama, p. 333, pl. 69, figs. 3, 4.
1978 *Scapharca inaequivalvis* - Kirtisinghe, p. 23, pl. 9, fig. 7.
1985 *Scapharca inaequivalvis* - Cesari & Pelizzato, p. 240, pl. 1, fig. 2.
1994 *Scapharca inaequivalvis* - Rinaldi, p. 229-231, figs. 1, 2.
1996 *Anadara inaequivalvis* - Jansen, p. 38, pl. 3, fig. 148.
1998 *Anadara (Scapharca) inaequivalvis* - Lamprell & Healy, p. 56, fig. 85.

The Thai specimens exhibit 1) shell slightly longer than high, 2) oblique, straight posterior margin and 3) sculpture of 32-33 flat, smooth ribs wider than the intervening furrows. These characters conform to those of *Scapharca inaequivalvis* (Bruguière, 1789). *Scapharca natalensis* (Krauss, 1848) appears to be strongly related but has a subquadrate shell as high as or higher than long. Other similar Indo-Pacific *Scapharca* species differ in having more numerous ribs.

DISTRIBUTION AND HABITAT. *Scapharca inaequivalvis* is distributed in the Indo-Pacific, from the Red Sea to Australia and northward to Japan. It has recently entered the Mediterranean. *Scapharca inaequivalvis* is reported to dwell in sandy and muddy substrates in the intertidal and upper infralittoral zones (BERNARD et al., 1993). Previous records in Thai waters were from mud or muddy sand at depths of from 2 to 54 m (LYNGE, 1909 sub *Arca rhomboidalis*; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Late Miocene and Pliocene of Indonesia; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Scapharca indica (Gmelin, 1791)

Pl. 2, fig. 9

? 1907 *Arca (Argina) indica* - Lamy, p. 295.
1909 *Arca (Scapharca) indica* - Lynge, p. 126, pl. 2, figs. 5-12.
1995 *Scapharca indica* - Bosch, Dance, Moolenbeek & Oliver, p. 211, fig. 928.

The species exhibits 1) elongate-subrectangular, relatively thin shell attaining 50 mm in length, 2) beaks at the anterior third and 3) sculpture of 32-35 flat radial ribs, broader posteriorly and wider than the intervening furrows; fresh specimens are coated with a brown periostracum. *Scapharca deyrollei* Jousseaume, 1893 and *Scapharca jousseaumei* Lamy, 1907 are possible synonyms.

DISTRIBUTION AND HABITAT. *Scapharca indica* is distributed in the Indo-Pacific, from the Persian Gulf to Indonesia and northwest Australia at least. MORRIS & PURCHON (1981) recorded it from intertidal sands and rocks on the west coast of Malaya. It is of note that *Scapharca deyrollei* is reported to dwell on sandy and rocky substrates in the intertidal zone and down to 15 m depth (BERNARD et al., 1993).

FOSSIL RECORDS: Holocene of Thailand.

Family *NOETIIDAE*

Subfamily *Noetiinae*

Sheldonella lateralis (Reeve, 1844)

Pl. 2, fig. 10

1844b *Arca lateralis* Reeve, p. 127.
1907 *Arca (Noetia) lateralis* - Lamy, p. 303.
1917a *Arca (Noetia) lateralis* - Lamy, p. 111.
1956 *Arca lateralis* - Satyamurti, p. 23, pl. 2, fig. 6.
1992 *Sheldonella lateralis* - Oliver, p. 40, pl. 4, fig. 2.
1995 *Sheldonella lateralis* - Bosch, Dance, Moolenbeek & Oliver, p. 212, fig. 931.

Sheldonella lateralis is a distinctive species on account of 1) shell posteriorly expanded, 2) prominent, blunt umbonal ridge and 3) sculpture of radial riblets which are broader and bifurcated over the umbonal ridge; a finer riblet regularly intervenes. There is no Indo-Pacific relative.

DISTRIBUTION AND HABITAT. The species occurs uncommonly in the Indo-Pacific, from Madagascar to Southeast Asia. It lives attached to hard substrates, in crevices in the lower intertidal and subtidal zones (BOSCH et al., 1995).

FOSSIL RECORDS: None recorded.

Subfamily *Striarcinae*

Striarca symmetrica (Reeve, 1844)

Pl. 2, fig. 12

1844b *Arca symmetrica* Reeve, p. 127.
1907 *Arca (Fossularca) symmetrica* - Lamy, p. 103.
1909 *Arca (Fossularca) sculptilis* - Lynge, p. 115.
1932 *Arca (Fossularca) symmetrica* - Prashad, p. 54.
1951 *Striarca (Galactella) symmetrica* - Habe, p. 9, figs. 60, 61.
1953a *Striarca (Galactella) symmetrica* - Habe, p. 209, pl. 30, figs. 12, 13.
1956 *Arca symmetrica* - Satyamurti, p. 22, pl. 2, fig. 5.
1961 *Striarca (Galactella) symmetrica* - Hayasaka, p. 27, pl. 2, fig. 12.
1965 *Striarca (Galactella) symmetrica* - Kira, p. 121, pl. 43, fig. 5.
1966 *Striarca symmetrica* - Noda, p. 73.
1968 *Striarca (Galactella) symmetrica* - Habe, p. 163, pl. 49, fig. 1.
1973 *Striarca symmetrica* - Itoigawa & Ogawa, pl. 5, fig. 3.
1977 *Arcopsis symmetrica* - Habe, p. 41, pl. 7, figs. 11, 12.
1984 *Arcopsis symmetrica* - Matsukuma, p. 6, pl. 1, fig. 1.
1985 *Striarca symmetrica* - Oliver, p. 305, pl. 1, fig. a.
1986 *Arcopsis symmetrica* - Takayasu, pl. 75, figs. 2, 7, 8.
1986 *Arcopsis symmetrica* - Sato, Masuda & Shuto, p. 14.
1988b *Arcopsis symmetrica* - Noda, p. 122, pl. 2, figs. 4, 7-8b.
1995 *Striarca symmetrica* - Bosch, Dance, Moolenbeek & Oliver, p. 212, fig. 930.
1995 *Striarca symmetrica* - Kubo & Kurozumi, p. 151, fig. 1.
1998 *Arcopsis symmrica* (sic) - Lamprell & Healy, p. 64, fig. 102.

Striarca symmetrica has 1) small, subequilateral shell not exceeding 12 mm in length, 2) short triangular ligament, 3) continuous dentition, 4) thread-like myophoric ridge at the inner side of both adductor scars and 5) fine riblets and concentric ridges weakly beaded where they cross the ribs. Shape and sculpture are the most distinctive characters.

DISTRIBUTION AND HABITAT. The species ranges from the Persian Gulf to Australia and northward to China Sea and Japan. It is an epibyssate element occurring commonly in sheltered areas intertidally and down to over 60 m depth (KIRA, 1965; OLIVER, 1985; BERNARD et al., 1993; BOSCH et al., 1995). Previous records in the Gulf of Thailand were from mixed bottoms 2-68 m deep (LYNGE, 1909 sub *Arca sculptilis*).

FOSSIL RECORDS: Mid Miocene of Indonesia; Late Miocene of Indonesia and Japan; Pliocene of Indonesia and Japan; Quaternary of Southeast Asia and Japan; Holocene of Thailand.

Didimacar tenebrica (Reeve, 1844)

Pl. 2, fig. 11

1844b *Arca tenebrica* Reeve, p. 126.
1907 *Arca (Fossularca) tenebrica* - Lamy, p. 105.
1909 *Arca (Striarca) tenebrica* - Lynge, p. 116.
1922 *Arca tenebrica* - Dickerson, pl. 6, fig. 5.
1951 *Striarca (Didimacar) tenebrica* - Habe, p. 40, figs. 63, 64.
1953a *Striarca (Didimacar) tenebrica* - Habe, p. 212, pl. 30, figs. 6, 19.
1954 *Striarca (Didimacar) tenebrica* - Taki & Oyama, pl. 18, fig. 5; pl. 42, fig. 7.
1961 *Striarca (Didimacar) tenebrica* - Hayasaka, p. 28, pl. 2, fig. 10.
1965 *Striarca (Didimacar) tenebrica* - Kira, p. 122, pl. 43, fig. 8.
1966 *Striarca tenebrica* - Noda, p. 74, pl. 4, figs. 4-7.
1977 *Didimacar tenebrica* - Habe, p. 41, pl. 7, figs. 15, 16.
1982 *Striarca tenebrica* - Kanno, O'Hara & Caagusan, p. 61, pl. 14, fig. 4.
1985 *Didimacar tenebrica* - Oliver, pl. 4, fig. b.

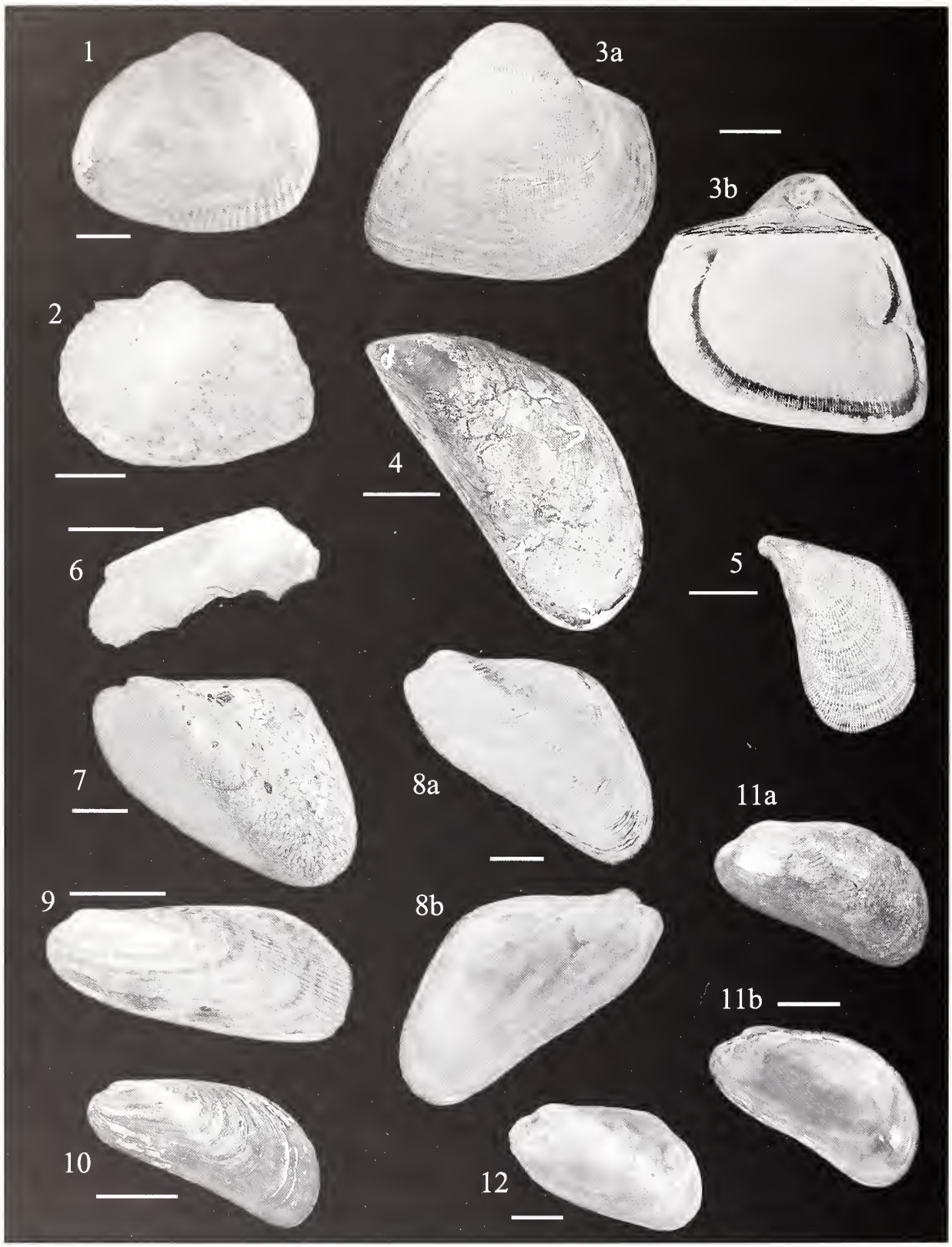

Plate 3: Fig. 1. *Verilarca (Verilarca) sinensis* (Thiele & Jaeckel, 1931), Station TH 32; scale bar 2 mm. Fig. 2. *Verilarca (Spinearca) mortenseni* (Lynge, 1909), Station TH 39; scale bar 1 mm. Figs. 3a, 3b. *Cucullaea labiata* (Lightfoot, 1786), sand spit near Ban Laem Phak Bia; scale bar 20 mm. Fig. 4. *Perna viridis* (Linnaeus, 1758), Station TH 13; scale bar 10 mm. Fig. 5. *Septifer bilocularis* (Linnaeus, 1758), Station TH 101; scale bar 10 mm. Fig. 6. *Modiolus (Modiolus) elongatus* (Swainson, 1821), Station TH 98; scale bar 5 mm. Fig. 7. *Modiolus (Modiolus) metcalfei* (Hanley, 1843), Station TH 68, scale bar 5 mm. Figs. 8a, 8b. *Modiolus (Modiolus) philippinarum* (Hanley, 1844), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 9. *Musculista japonica* (Dunker, 1856), Station TH 36; scale bar 10 mm. Fig. 10. *Arcuatula arcuatula* (Hanley, 1843), Station TH 115; scale bar 10 mm. Figs. 11a, 11b, 12. *Musculista senhousia* (Benson, 1842), Station TH 11; scale bar 3 mm (fig. 11); scale bar 1 mm (fig. 12).

1990 *Didimacar tenebrica* - Oliver, p. 1091, pl. 1, fig. a, b; pl. 5, figs. a-g; pl. 6, figs. a-d; pl. 7, figs. a, b.
1990 *Striarca (Didimarca) tenebrica* - Noda & Sato, pl. 1, fig. 22.
1994 *Didimacar tenebrica* - Scott, p. 64, pl. 3, fig. B.
1995 *Didimacar tenebrica* - Bosch, Dance, Moolenbeek & Oliver, p. 212, fig. 933.

Didimacar tenebrica is featured by 1) subrectangular, inequilateral shell attaining 15 mm in length, 2) oblique posterior margin and 3) sculpture of numerous, alternating radial riblets and threads.
DISTRIBUTION AND HABITAT. The species ranges from India to Southeast Asia, Queensland and northward to Japan and China. It is an epifaunal element usually found intertidally and down to 20 m on rubble bottoms (LYNGE, 1909; KIRA, 1965), but may occasionally occur in the mangrove swamps (MORTON, 1983; LI FU-XIE & GAO SHI-HE, 1985). OLIVER (1990) stated that the tranquil areas on underside of boulders, where the wave action is slight, represent the preferred habitat of *Didimacar*.
FOSSIL RECORDS: Late Miocene of Philippines; Pliocene and Quaternary of Japan; Holocene of Thailand.

Estellacar olivacea (Reeve, 1844)

Pl. 2, fig. 13

1844b *Arca olivacea* Reeve, p. 127.
1907 *Arca (Fossularca) olivacea* - Lamy, p. 105.
1953a *Striarca (Estellarca) olivacea* - Habe, p. 210, pl. 30, figs. 4, 5.
1968 *Striarca (Estellarca) olivacea* - Habe, p. 163, pl. 49, fig. 9.
1977 *Estellarca olivacea* - Habe, p. 41, pl. 7, figs. 9, 10.
Not 1978 *Striarca olivacea* - Popenoe & Kleinpell, pl. 13, figs. 164, 165.
1985 *Estellarca olivacea* - Oliver, pl. 4, fig. 1.
1987 *Estellacar olivacea* - Oliver, p. 285, pl. 26, figs. 5, 7; pl. 27, fig. 2.
1998 *Striarca olivacea* - Lamprell & Healy, p. 64, fig. 100.

The species is featured by 1) subelliptical, nearly equilateral and rather tumid shell attaining 20 mm in length, 2) blunt postero-ventral angle, 3) slightly arched, rather weak hinge and 4) sculpture of numerous thread-like radial riblets. *Estellacar galactodes* (Benson, 1842) is strongly related, but differs mainly in having coarser, less numerous riblets.
DISTRIBUTION AND HABITAT. The species is an infaunal element ranging from Southeast Asia to Japan. *Estellacar olivacea* dwells in mud and sand from the intertidal zone down to 20 m depth (HABE, 1968; BERNARD et al., 1993).
FOSSIL RECORDS: Holocene of Thailand.

Scelidionarca pectunculiformis (Dunker, 1866)

Pl. 2, fig. 14

1907 *Arca pectunculiformis* - Lamy, p. 300.
Not 1909 *Arca (Fossularca) pectunculiformis* - Lynge, p. 115.
1979 *Striarca pectunculiformis* - Tantanasiriwong, p. 4.
1987 *Scelidionarca pectunculiformis* - Oliver, p. 286, pl. 27, figs. 3, 4 (*cum syn.*).

The species is featured by 1) roundly-trapezoidal, slightly longer than high, inequilateral, shell up to 27 mm in length, 2) beaks slightly opisthogyre, 3) rounded anteriorly, subtriangular posteriorly, 4) arched, short hinge line and 5) outer surface with dense, faint radials and relatively coarse growth markings resulting in a *Glycymerys*-like aspect.
DISTRIBUTION AND HABITAT. *Scelidionarca pectunculiformis* is an infaunal element occurring uncommonly from India to Southwest Pacific. In western Thai waters, it was recovered from mud flats seaward of the mangrove forest (TANTANASIRIWONG, 1979).
FOSSIL RECORDS: Holocene of Thailand.

Verilarca (Verilarca) sinensis (Thiele & Jaeckel, 1931)

Pl. 3, fig. 1

Not 1978 *Striarca sinensis* - Popenoe & Kleinpell, pl. 13, fig. 166 (= *Striarca thielei* Schenck & Reinhart, 1938).
1985 *Verilarca sinensis* - Oliver, p. 307, pl. 3, fig. a-c.

Verilarca sinensis is herein intended according to OLIVER (1985). It is featured by 1) squarely-oval, nearly equilateral shell attaining 10 mm in length, 2) rounded anteriorly, obliquely truncated posteriorly and 3) sculpture of over 60 radial riblets, the anterior and posterior ones distinctly nodose. *Verilarca thielei* (Schenck & Reinhart) is related, but exhibits somewhat longer shell with more rounded postero-ventral angulation.
DISTRIBUTION AND HABITAT. The species ranges widely throughout the Indo-Pacific, from the Arabian Sea to Queensland and northward to Hong Kong. It is an infaunal element inhabiting muddy substrates in the intertidal and upper infralittoral zones (OLIVER, 1985; BERNARD et al., 1993).
FOSSIL RECORDS: Pliocene of Philippines; Holocene of Thailand.

Verilarca (Spinearca) mortenseni (Lynge, 1909)

Pl. 3, fig. 2

1909 *Arca (Anadara) mortenseni* Lynge, p. 120, pl. 2, figs. 1, 2.
1985 *Verilarca (Spinearca) mortensi* (sic) - Oliver, pl. 3, fig. e.
1995 *Anadara mortenseni* - Scott, p. 38, fig. in same page.

Verilarca mortenseni is featured by 1) ovate-rectangular, slightly inequilateral shell attaining 12 mm in length, 2) rounded anterior side, 3) steeply truncated, subvertical posterior side and 4) sculpture of 45-47 radial riblets bearing pointed nodules and faint, evenly spaced, overriding commarginal lamellae. *Verilarca sinensis* (Thiele & Jaeckel, 1931) is similarly shaped, but has more numerous riblets and is devoid of commarginal lamellae.
DISTRIBUTION AND HABITAT. The species is an infaunal element so far known only from the Gulf of Thailand. It was described on the basis of a single specimen recovered from sandy mud at a depth of 54 m; recent records were from muddy bottoms 60-70 m deep (SCOTT, 1995).
FOSSIL RECORDS: none recorded.

Family *CUCULLAEIDAE*

Cucullaea labiata (Lightfoot, 1786)

Pl. 3, fig. 3

1909 *Arca (Cucullearca) concamerata* - Lynge, p. 128.
1969 *Cucullaea (Cucullaea) labiata* - Treatise I. P., p. N260, fig. C 8 (5).
1982 *Cucullaea labiata* - Abbott & Dance, p. 294, figs. in top row, middle, right.
1991 *Cucullaea labiata* - Abbott, p. 90, pl. 44, fig. 7.
1998 *Cucullaea labiata* - Lamprell & Healy, p. 62, fig. 97.

Distinctive features are 1) transversely subquadrate in outline, higher posteriorly than anteriorly, heart-shaped in antero-posterior view, inequilateral, thick shell up to 120 mm in length, 2) elevated beaks, 3) sharp posterior keel, 4) hinge with end teeth large and subhorizontal, 5) posterior adductor scar on prominent myophoric buttress, 6) sculpture of numerous low and weak radial riblets. *Cucullaea granulosa* (Jonas, 1846) is regarded as a synonym of the present species by BERNARD et al. (1993). Actually, this taxon has longer than high rectangular shell, more depressed beaks and granulated ribs. The specimens from the Persian Gulf referred to as

Cucullaea labiata by BOSCH & BOSCH (1982, 1989) and BOSCH et al. (1995) exhibit lower and longer shell and perfectly conform to that figured as *Cucullaea cucullata* (Röding, 1798) by OLIVER (1992).

DISTRIBUTION AND HABITAT. *Cucullaea labiata* is distributed from the Red Sea to Australia and northward to Japan. It occurs on sandy or muddy substrates at depths of from 10 to 140 m (BERNARD et al., 1993; LAMPRELL & HEALY, 1998). Previous records in Thai waters were from muddy or shelly bottoms 18-54 m deep (LYNGE, 1909, sub *Arca concamerata*; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: none recorded.

Superfamily MYTILOIDEA
Family *MYTILIDAE*
Subfamily *Mytilinae*

Perna viridis (Linnaeus, 1758)
Pl. 3, fig. 4

1909 *Mytilus (Chloromya) viridis* - Lynge, p. 129.
1936b *Mytilus (Chloromya) viridis* - Lamy, p. 139.
1956 *Mytilus viridis* - Satyamurti, p. 42, pl. 5, fig. 1.
1960 *Mytilus (Chloromya) smaragdinus* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 19, fig. 15.
1968 *Mytilus viridis* - Cheriyan, p. 128.
1978 *Mytilus viridis* - Kirtisinghe, p. 15, pl. 1, fig. 8.
1980 *Perna viridis* - Wu, p. 103, pl. 1, fig. C.
1982 *Perna viridis* - Abbott & Dance, p. 297, fig. in upper mid row, right.
1986 *Perna viridis* - Springsteen & Leobrera, p. 310, pl. 88, fig. 2.
1991 *Perna viridis* - Abbott, p. 91, pl. 44, fig. 5.
1992 *Perna viridis* - Dharma, p. 80, pl. 18, fig. 11.
1995 *Perna viridis* - Kubo & Kurozumi, p. 155, fig. 3.

Perna viridis is readily recognized on the basis of 1) mytiliform shell up to 160 mm in length, 2) bright green periostracum and 3) 1-2 tooth-like ridges under beaks.

DISTRIBUTION AND HABITAT. The species is distributed in the Indian and West Pacific oceans. *Perna viridis* is epibyssate on hard substrates (rocks, timber, skeletal remains) from the intertidal zone to 20 m depth (BERNARD et al., 1993). It is intensively marketed; specimens are collected in sheltered subtidal waters or cultivated all over Southeast Asia.

FOSSIL RECORDS: none recorded.

Septifer bilocularis (Linnaeus, 1758)
Pl. 3, fig. 5

1858 *Septifer bilocularis* - Adams & Adams, p. 522, pl. 122, figs. 3, 3a.
1909 *Septifer bilocularis* - Lynge, p. 135.
1932 *Brachidontes (Septifer) bilocularis* - Prashad, p. 69, pl. 2, figs. 21-24 (*cum syn.*).
1936b *Septifer bilocularis* - Lamy, p. 240 (*cum syn.*).
1939 *Brachidontes (Septifer) bilocularis* - Adams & Leloup, p. 46.
1951 *Septifer bilocularis* - Habe, p. 53, figs. 93, 94.
1956 *Septifer bilocularis* - Satyamurti, p. 35, pl. 4, fig. 3.
1960 *Septifer bilocularis* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 20, fig. 16.
1960 *Brachydontes bilocularis* - Paes da Franca, p. 89, pl. 19, fig. 2.
1964 Septifer bilocularis - Spry, p. 14, pl. 2, fig. 64.
1965 *Septifer bilocularis* - Kira, p. 128, pl. 46, fig. 10.
1969 *Septifer bilocularis* - Treatise I. P., p. N274, fig. C18 (2).
1971 *Septifer bilocularis* - Kuroda, Habe & Oyama, p. 343, pl. 74, figs. 19, 20.
1973 *Septifer bilocularis* - Selli, p. 173, pl. 2, fig. 1.
1974 *Septifer bilocularis* - Brandt, p. 258.
1976a *Septifer bilocularis* - Nielsen, p. 3, fig. 8.
1977 *Septifer (Septifer) bilocularis* - Habe, p. 53, pl. 11, figs. 11, 12.
1978 *Septifer bilocularis* - Kirtisinghe, p. 15, pl. 1, fig. 7.
1980 *Septifer bilocularis* - Tien-Hsi Tan, Chi-Chun Wang & Chung-Hung Chen, p. 67, top fig.
1981 *Septifer bilocularis* - Eisenberg, p. 156, pl. 138, figs. 7-7c.
1981 *Septifer bilocularis* - Richards, p. 80, pl. 50, figs. 448, 448a.
1982 *Septifer bilocularis* - Abbott & Dance, p. 298, fig. in mid-upper row, left.
1984 *Septifer bilocularis* - Matsukuma, p. 7, pl. 1, fig. 16.
1985 *Septifer biocularis* - Lee & Morton, p. 56, pl. 2, fig. C.
1986 *Septifer bilocularis* - Springsteen & Leobrera, p. 310, pl. 88, fig. 6.
1988 *Septifer bilocularis* - Drivas & Jay, pl. 52, fig. 8.
1990 *Septifer bilocularis* - Wells, Bryce, Clark & Hansen, p. 79, pl. 74, fig. 342.
1992 *Septifer bilocularis* - Dharma, pl. 18, fig. 9.
1992 *Septifer bilocularis* var. *forskali* - Oliver, p. 48, pl. 5, fig. 3.
1995 *Septifer bilocularis* var *forskali* - Bosch, Dance, Moolenbeek & Oliver, p. 214, fig. 942.
1995 *Septifer bilocularis* - Kubo & Kurozumi, p. 155, fig. 1.
1998 *Septifer bilocularis* - Lamprell & Healy, p. 78, fig. 158.

Septifer bilocularis is featured by 1) subquadrangular shell up to 50 mm, 2) dorsal and posterior margins forming a rounded angle and 3) numerous and fine, often bifurcating radial riblets. The Indo-Pacific *Septifer excisus* (Wiegmann, 1837) and *Septifer virgatus* (Wiegmann, 1837) are related species but differ in having a triangular-elongate shell with the dorsal and posterior margins gradually merging into one another through a regular curve. *Septifer keenae* Nomura, 1936 has strong ribs.

DISTRIBUTION AND HABITAT. *Septifer bilocularis* ranges widely in the Indo-Pacific, from South Africa to Caroline and Marshall Islands and northward to Japan. It attaches by byssus to hard substrates (rocks, corals and coral rubble, boulders, shells) in the lower intertidal zone and down to 15 m depth (KIRA, 1965; PURCHON & PURCHON, 1981; LEE & MORTON, 1985; BERNARD et al., 1993). According to LEE & MORTON (1985), the species is very abundant at sheltered sites and is rarely recorded from polluted waters. Previous records in Thai waters were from reef flats, coral rubble, sand, shells, mud and gravel in the 2-54 m bathymetric interval (LYNGE, 1909; NIELSEN, 1976; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Neogene (undefined) of Myanmar and Indonesia; Pliocene of Indonesia; Quaternary of the Indo-Pacific area.

Subfamily *Modiolinae*

Modiolus (Modiolus) elongatus (Swainson, 1821)
Pl. 3, fig. 6

1909 *Modiola rhomboidea* - Lynge, p. 130.
1909 *Modiola elongata* - Lynge, p. 131.
1932 *Modiolus (Modiolus) elongatus* - Prashad, p. 71.
1937 *Modiolus elongatus* - Lamy, p. 322.
1937 *Modiolus sirahensis* - Lamy, p. 325.
1937 *Modiolus nitidus* - Lamy, p. 328.
1951 *Volsella (Modiolatus) nitida* - Habe, p. 51, fig. 95.
1968 *Modiolus (Modiolusia) nitidus* - Habe, p. 168, pl. 50, fig. 25.
1971 *Modiolus (Modiolusia) elongatus* - Kuroda, Habe & Oyama, p. 346, pl. 73, figs. 1-3.
1977 *Modiolus (Modiolusia) elongatus* - Habe, p. 55, pl. 10, fig. 10.
1985 *Modiolus elongatus* - Lee & Morton, p. 59, pl. 4, fig. C.
1986 *Modiolus (Modiolusia) elongatus* - Takayasu, pl. 40, fig. 5; pl. 81, fig. 23.
1990 *Modiolus (Modiolus) elongatus* - Ito, p. 117, pl. 27, fig. 12.
1992 *Modiolus (Modiolatus) sirahensis* - Oliver, p. 53, pl. 6, fig. 5.
1993 *Modiolus (Modiolusia) elongatus* - Noda, Kikuchi & Nikaido, p. 139, fig. 13 (20).
1995 *Modiolus sirahensis* - Bosch, Dance, Moolenbeek & Oliver, p. 216, fig. 948.
1998 *Modiolus (Modiolus) elongatus* - Lamprell & Healy, p. 82, fig. 175.

Modiolus elongatus is readily distinguished on account of the very elongated shell attaining 80 mm in lenght. *Modiola nitida* Reeve,

1857 and *Modiola sirahensis* Jousseaume, 1891 are junior synonyms.
DISTRIBUTION AND HABITAT. *Modiolus elongatus* ranges from the Red Sea to Indonesia and northward to Japan. BERNARD et al. (1993, sub *Modiolus nitidus*) report it to live attached to rocks and gravel in the 10-100 m bathymetric interval. According to HABE (1968), LEE & MORTON (1985) and OLIVER (1992), *Modiolus elongatus* dwells in soft muddy sublittoral substrates, cocooned within a byssal nest. Previous records in the Gulf of Thailand were from muddy, occasionally sandy, bottoms 5-36 m deep (LYNGE, 1909).
FOSSIL RECORDS: Pliocene of Japan.

Modiolus (Modiolus) metcalfei (Hanley, 1844)

Pl. 3, fig. 7

1844 *Modiola metcalfei* Hanley, p. 14.
1909 *Modiola metcalfei* - Lynge, p. 131.
1936b *Modiolus metcalfei* - Lamy. P. 288.
1956 *Modiolus metcalfei* - Satyamurti, p. 31, pl. 3, fig. 4.
1960 *Modiolus metcalfei* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 30, fig. 25.
1968 *Modiolus metcalfei* - Habe, p. 168, pl. 50, fig. 26.
1971 *Modiolus (Modiolus) metcalfei* - Kuroda, Habe & Oyama, p. 346, pl. 73, figs. 8-10.
1978 *Modiolus metcalfei* - Kirtisinghe, p. 14, pl. 1, fig. 4.
1980 *Modiolus metcalfei* - Wu, p. 103, pl. 1, fig. D.
1985 *Modiolus metcalfei* - Lee & Morton, p. 59, pl. 4, fig. B.

Modiolus metcalfei is readily recognized on the basis of 1) trigonal, smooth shell up to 50 mm in length, 2) high, expanded posterior side and 3) straight, oblique posterior margin.
DISTRIBUTION AND HABITAT. The species ranges from the Indian Ocean into the Southwest Pacific and northward to Japan. It lives attached by byssus on sandy or muddy substrates from the intertidal zone down to 5 m (BERNARD et al., 1993). According to LEE & MORTON (1985), *Modiolus metcalfei* is an estuarine element occuring in soft intertidal substrates. In Hong Kong waters, it is largely restricted to mangrove-dominated shores in mud; solitary specimens are also noted on the seaward fringe of mangrove stands often attached to mangrove roots.
FOSSIL RECORDS: Pliocene of Indonesia; Quaternary of the Indo-Pacific area.

Modiolus (Modiolus) philippinarum (Hanley, 1844)

Pl. 3, fig. 8

1844a *Modiola philippinarum* Hanley, p. 15.
1909 *Modiola philippinarum* - Lynge, p. 132.
1932 *Modiolus (Modiolus) philippinarum* - Prashad, p. 72, pl. 2, figs. 25, 26.
1936b *Modiolus philippinarum* - Lamy, p. 284.
1960 *Modiolus philippinarum* - Paes da Franca, p. 88, pl. 19, fig. 1.
1960 *Modiolus philippinarum* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 29, fig. 24.
1964 *Modiolus philippinarum* - Spry, p. 13, pl. 2, fig. 58.
1965 *Modiolus philippinarum* - Kira, p. 129, pl. 46, fig. 18.
1981 *Modiolus philippinarum* - Richards, p. 81, pl. 50, fig. 450.
1982 *Modiolus philippinarum* - Abbott & Dance, p. 298, fig. in bottom row, right.
1982 *Modiolus philippinarum* - Bosch & Bosch, p. 153, lower fig.
1984 *Modiolus philippinarum* - Matsukuma, p. 7.
1985 *Modiolus philippinarum* - Lee & Morton, p. 60, pl. 5, fig. B.
1986 *Modiolus philippinarum* - Springsteen & Leobrera, p. 309, pl. 88, fig. 1.
1989 *Modiolus philippinarum* - Bosch & Bosch, p. 81, middle fig.
1992 *Modiolus philippinarum* - Oliver, p. 52, pl. 6, fig. 3.
1995 *Modiolus philippinarum* - Bosch, Dance, Moolenbeek & Oliver, p. 215, fig. 946.
1995 *Modiolus philippinarum* - Kubo & Kurozumi, p. 153, bottom fig. (unnumbered).
1998 *Modiolus (Modiolus) philippinarum* - Lamprell & Healy, p. 82, fig. 171.

Modiolus philippinarum has 1) elongate-subtriangular shell up to 60 mm in length, 2) straight, oblique posterior margin and 3) slightly concave ventral margin. *Modiolus metcalfei* (Hanley, 1844) is a related species differing in that has wider posterior part, smaller postero-dorsal angle and straight ventral margin.
DISTRIBUTION AND HABITAT. *Modiolus philippinarum* is widely distributed in the Indo-Pacific, from Mozambique to Red Sea, Australia, Caroline and Marshall Islands and northward to Japan. According to BERNARD et al. (1993), it occurs in muddy and sandy substrates from the intertidal zone down to 10 m depth. In Hong Kong waters, the species was noted on oceanic shores, attached to pebbles or sand grains in sand or mud, only exposing the posterior shell edge (LEE & MORTON, 1985). Previous records in Thai waters were from reef flats (TANTANASIRIWONG, 1979) or shelly bottoms 16-54 m deep (LYNGE, 1909).
FOSSIL RECORDS: Early Miocene of Mozambique; Middle Miocene of the Philippines; Quaternary of South Africa; Holocene of Thailand.

Modiolus (Modiolus) plumescens (Dunker, 1868)

1909 *Modiola plumescens* - Lynge, p. 131, pl. 2, fig. 13, 14.
1936b *Modiolus plumescens* - Lamy, p. 274.
1976a *Modiolus plumescens* - Nielsen, p. 3, fig. 15.
1984 *Modiolus auriculatus* - Matsukuma, p. 7, pl. 1, fig. 15.
1989 *Modiolus (Modiolus) auriculatus* - Ito, p. 59, pl. 19, fig. 10.

Modiolus plumescens is featured by 1) high, ovate-triangular shell attaining 25 mm in length, 2) arched posterior margin and 3) distinct radial depression ventral to the umbonal ridge. It is distinguished from the related *Modiolus metcalfei* (Hanley, 1844) and *Modiolus philippinarum* (Hanley, 1844) primarily because of the curved posterior margin. According to the figure of *Modiolus auriculatus* Krauss, 1848 published by LAMPRELL & HEALY (1998, p. 83, fig. 168), that species has a subquadrangular, elongated shell.
DISTRIBUTION AND HABITAT. The species ranges from the Gulf of Thailand to Indonesia, Caroline, Marshall and Samoa Islands. It is an epibyssate element occurring on reef flats (NIELSEN, 1976; MATSUKUMA, 1984 sub *Modiolus auriculatus*). Previous records in the Gulf of Thailand were from sand and shell bottoms 2-54 m deep (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand (Bangkok Clay).

Subfamily *Crenellinae*

Arcuatula arcuatula (Hanley, 1844)

Pl. 3, fig. 10

1844a *Modiola arcuatula* - Hanley, p. 16.
1909 *Modiola arcuatula* - Lynge, p. 133.
1919 *Modiola (Arcuatula) arcuatula* - Lamy, p. 173.
1937 *Modiolus arcuatulus* - Lamy, p. 342.
1969 *Arcuatula arcuatula* - Treatise I. P., p. N275, fig. C19 (3).
Not 1972 *Modiolus arcuatulus* - Barash & Danin, p. 331, fig. 16.
Not 1974 *Brachidontes arcuatulus* - Brandt, p. 257, pl. 18, fig. 21.
Not 1974 *Modiolus arcuatulus* - Ghisotti, p. 11, pl. 1, fig. 5.
1984 *Arcuatula arcuatula* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 417, pl. 2, fig. 4.
1992 *Arcuatula arcuatula* - Oliver, p. 51, pl. 5, fig. 9.
Not 1992 *Modiolus arcuatulus* - Barash & Danin, p. 245, fig. 261 (= *Modiola senhousia* Benson, 1842).
1998 *Arcuatula arcuatula* - Lamprell & Healy, p. 86, fig. 193.

Arcuatula arcuatula is distinguished by 1) elongate modioliform shell attaining 30 mm in length, 2) prominent posterior ridge, 3)

crenate inner postero-dorsal margin, 4) concave ventral margin and 5) surface with a few anterior radial ribs and otherwise smooth, covered with a yellowish-brown periostracum. *Arcuatula elegans* (Gray, 1828) has a convex ventral margin.

DISTRIBUTION AND HABITAT. The species ranges from the Red Sea to Australia, western Indonesia, Philippines, China and Japan. It constructs a byssal nest within which it is cocooned in the mud in tidal flats and estuaries.

FOSSIL RECORDS: Holocene of Thailand.

Botula cinnamomea (Gmelin, 1791)

1909 *Lithodomus (Botula) cinnamomea* - Lynge, p. 138.
1932 *Lithophaga (Botula) cinnamomea* - Prashad, p. 79.
1956 *Lithophaga cinnamomea* - Satyamurti, p. 41, pl. 4, fig. 10.
1960 *Lithophaga (Botula) cinnamonina* (sic)- Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 42, fig. 36.
1968 *Botula silicula* - Habe, p. 167, pl. 50, fig. 13.
1976a *Botula cinnamomea* - Nielsen, p. 3, fig. 16.
1976b *Botula cinnamomea* - Nielsen, p. 145, figs. 3, 4 B.
1978 *Lithophaga cinnamomea* - Kirtisinghe, p. 14, pl. 1, fig. 2.
1979 *Botula silicula* - Kay, p. 509, figs. 164 E, F.
1984 *Botula cinnamomea* - Sharabati, pl. 40, figs. 3, 3a.
1984 *Botula silicula* - Matsukuma, p. 7, pl. 1, fig. 14.
1985 *Botula silicula* - Lee & Morton, p. 60, pl. 5, fig. D.
1986 *Botula cinnamomea* - Nielsen, p. 7, fig. 21.
1992 *Botula cinnamomea* - Oliver, p. 53, pl. 7, fig. 1.
1995 *Botula cinnamomea* - Bosch, Dance, Moolenbeek & Oliver, p. 217, fig. 960.

Botula cinnamomea has 1) subcylindrical, smooth shell up to 35 mm in length, 2) large, somewhat flattened umbonal area and 3) markedly prosogyrate beaks. The name *cinnamomea* Gmelin bears priority on *cinnamomea* Lamarck, 1819 and *silicula* Lamarck, 1819.

DISTRIBUTION AND HABITAT. *Botula cinnamomea* is distributed in the Indo-Pacific, from the Red Sea to Australia, Hawaii and northward to Japan. It is a soft rocks, shells and coral borer in the intertidal zone (LEE & MORTON, 1985; BERNARD et al., 1993). Records in western Thai waters were from reef flats (NIELSEN, 1976a); in the Gulf of Thailand, the species was recovered from rocky or shelly substrates and coral blocks at depths of from 2 to 54 m (LYNGE, 1909)

FOSSIL RECORDS: none recorded.

Musculista japonica (Dunker, 1856)

Pl. 3, fig. 9

1856 *Volsella japonica* Dunker, p. 363.
1937 *Modiolus japonicus* - Lamy, p. 349.
1965 *Musculus (Musculista) japonica* - Kira, p. 127, pl. 46, fig. 4.
1960 *Brachydontes japonicus* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 25, fig. 20.

The present species is featured by 1) elongate-oval, thin and fragile, modioliform shell attaining 37 mm in length, 2) beaks at the anterior one-ninth, 3) small, narrowly rounded anterior part, 4) obliquely arched posterior margin, 5) moderately convex, oblique ventral margin, 6) feebly crenate inner postero-dorsal margin, 7) outer surface with fine growth lines; fresh specimens exhibit undulating commarginal purple bands and postero-dorsal rays of the same color. *Musculista perfragilis* (Dunker, 1856) is strickingly similar and seems to differ only in that lacks the commarginal purple bands.

DISTRIBUTION AND HABITAT. *Musculista japonica* was so far reported to range from Taiwan to Japan. It occurs intertidally and down to 35 m depth (BERNARD et al., 1993) in predominantly muddy substrates, encased in a byssal nest.

FOSSIL RECORDS: none recorded.

Musculista senhousia (Benson, 1842)

Pl. 3, figs. 11, 12

1937 *Modiolus senhousei* - Lamy, p.347.
1951 *Brachidontes (Arcuatula) senhousia* - Habe, p. 52, fig. 91.
1954 *Brachidontes (Arcuatula) senhousia* - Taki & Oyama, pl. 46, fig. 6.
1960 *Brachydontes senhousei* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 24, fig. 19.
1965 *Musculus (Musculista) senhousia* - Kira, p. 127, pl. 46, fig. 1.
1971 *Musculus (Musculista) senhousia* - Kuroda, Habe & Oyama, p. 349, pl. 73, fig. 16.
1977 *Musculista senhousia* - Habe, p. 59, pl. 10, fig. 5.
1980 *Musculista senhousia* - Volova & Scarlato, p. 29, fig. 19.
1982 *Musculus senhousia* - Abbott & Dance, p. 298, fig. in bottom row, left.
1985 *Musculista senhausia* (sic) - Lee & Morton, p. 59, pl. 4, fig. A.
1992 *Modiolus arcuatulus* - Barash & Danin, p. 245, fig. 261.
1995 *Musculista senhousia* - Bosch, Dance, Moolenbeek & Oliver, p. 216, fig. 954.
1998 *Musculista senhousia* - Lamprell & Healy, p. 86, fig. 194.

Musculista senhousia is characterized by 1) modioliform shell attaining 32 mm in length, 2) beaks at the anterior one-sixth, 3) small, narrowly rounded anterior part, 4) obliquely arched posterior margin, 5) moderately concave ventral margin and 6) surface with 6-10 anterior radial ribs and otherwise unsculptured; fresh specimens exhibit some reddish-brown posterior radial rays. The present species is easily distinguished from *Musculista japonica* (Dunker, 1856) and *Musculista perfragilis* (Dunker, 1856) in that has clearly shorter shell.

DISTRIBUTION AND HABITAT. The species is distributed in the Indo-Pacific, from the Persian Gulf to Andaman Sea and northward to Northern Japan; it has recently entered the Mediterranean via Suez Canal and has been introduced into Australian and North American waters. According to BERNARD et al. (1993), *Musculista senhousia* dwells in muddy bottoms, intertidally and down to 20 m depth. In Hong Kong, it occurs on mud flats in estuarine and transitional waters, constructing a dense mat of byssal nests (LEE & MORTON, 1985). In western Thai waters, it was noted in clusters on mud flats seaward of mangrove forest (TANTANASIRIWONG, 1979). LEE & MORTON (1985) regarded *Musculista senhousia* as an opportunistic species "settling at times in large numbers to rapidly dominate a habitat and then with equal rapidity disappearing".

FOSSIL RECORDS: Quaternary of Japan.

Superfamily PTERIOIDEA
Family *PTERIIDAE*

Pteria brevialata (Dunker, 1872)

Pl. 4, fig. 1

1951 *Pteria (Austropteria) brevialata* - Habe, p. 62, fig. 123.
1965 *Pteria (Austropteria) brevialata* - Kira, p. 131, pl. 47, fig. 5; text figs. 3, 4 in p. 131.
1971 *Pteria (Austropteria) brevialata* - Kuroda, Habe & Oyama, p. 356, pl. 75, figs. 1, 2.
1977 *Pteria brevialata* - Habe, p. 69, pl. 13, fig. 8.
1995 *Pteria brevialata* - Kubo & Kurozumi, p. 159, fig. 5.
1998 *Pteria brevialata* - Lamprell & Healy, p. 96, fig. 227.

Distinctive features are 1) elongate, transversely subtriangular, markedly longer than high shell up to 90 mm in length, 2) anterior wing moderately long, posterior one long, 3) antero-dorsal margin slightly sloping, 4) anterior sulcus weak, 5) outer surface with obsolete posterior radial striation. The Australian *Pteria levita-*

ta (Iredale, 1939) is closely related, but has slightly higher shell with strong anterior sulcus.

DISTRIBUTION AND HABITAT. *Pteria brevialata* ranges from Australia to Southern Japan. It lives attached to gorgonians in the infralittoral zone (BERNARD et al., 1993).

FOSSIL RECORDS: none recorded.

Pinctada radiata (Leach, 1814)

Pl. 4, fig. 2

1909 *Pteria (Margaritifera) vulgaris* - Lynge, p. 142.
1964 *Pinctada vulgaris* - Spry, p. 11, pl. 1, fig. 36.
? 1976a *Pinctada radiata* - Nielsen, p. 3, fig. 19.
1979 *Pinctada radiata* - Kay, p. 518, fig. 166 B, C.
1979 *Pinctada radiata* - Tantanasiriwong, p. 6.
1984 *Pinctada radiata* - Sharabati, pl. 40, fig. 5, 5a, 5b.
1992 *Pinctada radiata* - Oliverio, Gerosa & Cocco, p. 149-152, fig. 1.
1992 *Pinctada radiata* - Barash & Danin, p. 248, fig. 264.
1992 *Pinctada radiata* - Oliver, p. 63, pl. 9, fig. 10 (*cum syn.*).
1995 *Pinctada radiata* - Bosch, Dance, Moolenbeek & Oliver, p. 220, fig. 971.

The species is featured by 1) roundly squared, markedly inequilateral shell up to 65 mm in length, 2) long, straight dorsal margin, 3) posterior margin moderately concave dorsally to delineate a distinct posterior wing, 4) triangular anterior wing well separated from the disc and 5) surface with commarginal lamellae and faint, more or less scaly radials.

DISTRIBUTION AND HABITAT. *Pinctada radiata* is widely distributed in the Indo-Pacific and has recently entered the Mediterranean via Suez Canal (BARASH & DANIN, 1992). It is common in the intertidal and subtidal zones down to 80 m, and attaches by byssus to stones, rocks, algae and corals or coral rubble (BARASH & DANIN, 1992; BERNARD et al., 1993). According to LYNGE (1909), the species, mainly represented by juvenile specimens, occurs in the Gulf of Thailand (sub *Pteria vulgaris*) on infralittoral mud, sand, gravel, shells and stones. *Pinctada radiata* was also recorded from mangrove in Singapore waters (MORRIS & PURCHON , 1981).

FOSSIL RECORDS: none recorded.

Family *MALLEIDAE*

Malleus (Malleus) albus Lamarck, 1819

Pl. 4, fig. 3

1909 *Malleus albus* - Lynge, p. 145.
1951 *Malleus (Malleus) albus* - Habe, p. 61, fig. 115.
1968 *Malleus albus* - Habe, p. 169, pl. 51, fig. 7.
1976 *Malleus (Malleus) albus* - Lindner, p. 216, pl. 53, fig. 9.
1977 *Malleus (Malleus) albus* - Habe, p. 74, pl. 12, fig. 2.
1978 *Malleus albus* - Cernohorsky, p. 179, pl. 63, fig. 5.
1982 *Malleus albus* - Abbott & Dance, p. 302, fig. in bottom row, middle.
1986 *Malleus albus* - Springsteen & Leobrera, p. 314, pl. 89, fig. 4.
1991 *Malleus albus* - Abbott, 1991, p. 92, pl. 44, fig. 6.
1992 *Malleus albus* - Oliver, p. 64, pl. 10, fig. 1.
1992 *Malleus albus* - Dharma, p. 80, pl. 18, fig. 15.
1994 *Malleus albus* - Scott, p. 66, pl. 4, fig. C.
1995 *Malleus albus* - Kubo & Kurozumi, p. 161, fig. 1.
1998 *Malleus (Malleus) albus* - Lamprell & Healy, p. 110, fig. 269.

This distinctive species is readily recognized by 1) rectangular, oblique, very high shell attaining 210 mm in height, 2) long, straight dorsal margin, 3) wings long, about of the same size, the anterior one usually slightly wider, 4) anterior and posterior margins broadly wavy, 5) outer surface yellowish-white. The closely related *Malleus malleus* (Linnaeus, 1758) has 1) anterior wing narrower and usually shorter than the posterior one and 2) blackish outer surface.

DISTRIBUTION AND HABITAT. *Malleus albus* ranges from the Red Sea to Australia and northward to Japan. According to BERNARD et al. (1993), it lives on rocks, intertidally and down to 10 m depth. LAMPRELL & HEALY (1998) recorded the species from muddy sand along beaches. Previous records in Thai waters were from muddy bottoms 14-54 m deep (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: none recorded.

Malleus (Malvufundus) regula (Forsskål, 1775)

Pl. 4, fig. 4

1909 *Malleus regula* - Lynge, p. 145.
1909 *Malleus regula* var. *decurtatus* - Lynge, p. 145.
1932 *Malleus regula* - Prashad, p. 105 (*cum syn.*).
1932 *Malleus regula* var. *decurtata* - Prashad, p. 106 (*cum syn.*).
1960 *Malleus regula* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 48, fig. 42.
1969 *Malleus (Malvufundus) regula* - Treatise I. P., p. N329, fig. C54 (3).
1972 *Malleus (Parimalleus) regula* - Barash & Danin, p. 334, fig. 19.
1973 *Malleus regula* - Biggs, 384.
1974 *Malleus regula* - Ghisotti, figs. 6, 9.
1976a *Malleus regula* - Nielsen, p. 3, figs. 25, 25a.
1977 *Malleus regula* - Barash & Danin, p. 100.
1979 *Malleus regula* - Kay, p. 521, figs. 167 I-K.
1992 *Malvifundus regula* - Oliver, p. 65, pl. 10, fig. 3 (*cum syn.*).
1992 *Malleus regula* - Barash & Danin, p. 249, fig. 265.
1995 *Malvufundus regula* - Bosch, Dance, Moolenbeek & Oliver, p. 221, fig. 975.
1995 *Malvifundus regulus* - Kubo & Kurozumi, p. 161, bottom fig.
1998 *Malleus (Malvufundus) regula* - Lamprell & Healy, p. 110, fig. 271.

The species is readily distinguished on the basis of 1) high, tongue-shaped shell and 2) poorly developed wings.

DISTRIBUTION AND HABITAT. *Malleus regula* is widely distributed in the Indo-Pacific, from South Africa to Australia, Hawaii and northward to Taiwan and South China Sea. It has recently entered the Mediterranean via Suez Canal. *Malleus regula* is an epibyssate element attached to rocks, corals and coral rubble in the intertidal zone and down to 69 m depth (KAY, 1979; BARASH & DANIN, 1992; BERNARD et al., 1993). Previous records in Thai waters were from reef flats (TANTANASIRIWONG, 1979) and shelly bottoms 2-54 m deep (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Vulsella vulsella (Linnaeus, 1758)

Pl. 4, fig. 5

1932 *Vulsella vulsella* - Prashad, p. 88.
1951 *Vulsella vulsella* - Habe, p. 61, figs. 116, 117.
1956 *Vulsella vulsella* - Satyamurti, p. 47, pl. 5, fig. 6.
1965 *Vulsella vulsella* - Kira, p. 130, pl. 46, fig. 25.
1969 *Vulsella vulsella* - Treatise I. P., p. 332, figs. C56, 1c, 1d.
1977 *Vulsella vulsella* - Habe, p. 73, pl. 13, figs. 3, 4.
1978 *Vulsella vulsella* - Cernohorsky, p. 179, pl. 64, fig. 1.
1978 *Vulsella vulsella* - Kirtisinghe, p. 19, pl. 4, fig. 2.
1982 *Vulsella vulsella* - Abbott & Dance, p. 302, fig. in bottom row, left.
1984 *Vulsella vulsella* - Sharabati, pl. 43, figs. 1-1f.
1986 *Vulsella vulsella* - Springsteen & Leobrera, p. 314, pl. 89, fig. 6.
1991 *Vulsella vulsella* - Lan Xiu, p. 327, pl. 4, fig. 10.
1992 *Vulsella vulsella* - Dharma, p. 80, pl. 18, fig. 14.
1992 *Vulsella vulsella* - Oliver, p. 66, pl. 11, fig. 5.
1995 *Vulsella vulsella* - Jansen, p. 95, fig. 395.
1995 *Vulsella vulsella* - Bosch, Dance, Moolenbeek & Oliver, p. 222, fig. 976.
1996 *Vulsella vulsella* - Jansen, p. 39, fig. 155.

Plate 4: Fig. 1. *Pteria brevialata* (Dunker, 1872), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 2a, 2b. *Pinctada radiata* (Leach, 1814), trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Fig. 3. *Malleus (Malleus) albus* Lamarck, 1819, trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Fig. 4. *Malleus (Malvufundus) regula* (Forsskål, 1775), sand spit near Ban Laem Phak Bia; scale bar 5 mm. Fig. 5. *Vulsella vulsella* (Linnaeus, 1758), Senanivate, Quarry 2, level SEN 2, Holocene; scale bar 4 mm. Fig. 6. *Isognomon isognomum* (Linnaeus, 1758), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 7. *Pinna bicolor* Gmelin, 1791, Station TH 108; scale bar 30 mm. Fig. 8. *Atrina (Servatrina) pectinata* (Linnaeus, 1767), trash-fish at Ban Laem Phak Bia; scale bar 30 mm. Fig. 9. *Limaria (Limaria) hasilanica* (Adams & Reeve, 1850), Station TH 108; scale bar 5 mm. Fig. 10. *Limaria (Limaria) fragilis* (Gmelin, 1791), Station TH 56; scale bar 5 mm.

1998 *Vulsella vulsella* - Lamprell & Healy, p. 112, fig. 273.

The species is readily recognized on account of 1) linguiform, subequivalve, markedly inequilateral shell nearly as high as twice the length, attaining 80 mm in height, 2) beaks terminal and 3) sculpture of commarginal lamellae and weak radial riblets.

DISTRIBUTION AND HABITAT. *Vulsella vulsella* is widespread in the tropical Indo-Pacific, commonly commensal in sponges, intertidally and down to 15 m depth (BERNARD et al., 1993).

FOSSIL RECORDS: Holocene of Thailand.

Family *ISOGNOMONIDAE*

Isognomon isognomum (Linnaeus, 1758)

Pl. 4, fig. 6

1909 *Perna vespertilio* - Lynge, p. 146.
1909 *Perna isognomon* - Lynge, p. 147.
1932 *Isognomon isognomum* - Prashad, p. 82 (*cum syn.*).
1932 *Isognomon isognomum* vars. *canina*, *norma* - Prashad, pp.83, 84 (*cum syn.*).
1939 *Pedalion (Isognomum) isognomum* - Adam & Leloup, p. 49.
1939 *Pedalion (Isognomum) caninum* - Adam & Leloup, p. 49.
1956 *Isognomon isognomum* var. *canina* - Satyamurti, p. 45, pl. 5, fig. 4.
1956 *Isognomon isognomum* var. *norma* - Satyamurti, p. 46. Pl. 5, fig. 5.
1960 *Pedalion isognomum* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 46, fig. 39.
1964 *Isognomon isognomum* - Spry, p. 10, pl. 1, fig. 26.
1965 *Isognum isognomum* - Kira, p. 130, pl. 46, fig. 26.
1969 *Isognomon (Isognum) isognomum* - Treatise I. P., p. N325, fig. C51 (6).
1976 *Pedalion isognomum* - Fischer-Piette, p. 8, pls. 1, 2.
1976a *Isognomon isognomum* - Nielsen, p. 3, figs. 22, 22a.
1978 *Isognomon isognomum* - Kirtisinghe, p. 19, pl. 4, fig. 3.
1978 *Isognomon isognomum* - Cernohorsky, p. 178, pl. 63, fig. 3.
1982 *Isognomon isognomum* - Abbott & Dance, p. 302, fig. in upper mid row, middle.
1984 *Isognomon (Isognum) isognomum* - Sharabati, pl. 40, fig. 8.
1986 *Isognomon (Isognum) isognomon* - Springsteen & Leobrera, p. 314, pl. 89, fig. 1.
1988 *Isognomon isognomon* - Drivas & Jay, pl. 56, fig. 13.
1990 *Isognomon isognomum* - Wells, Bryce, Clark & Hansen, p. 81, pl. 75, fig. 351.
1991 *Isognomon isognomon* - Abbott, p. 92, pl. 43, fig. 4.
1992 *Isognomon (Isognum) isognomon* - Oliver, p. 67, pl. 11, fig. 1.
1992 *Isognomon isognomum* - Dharma, pl. 18, fig. 13.
1998 *Isognomon (Isognomon) isognomon* - Lamprell & Healy, p. 106, fig. 256.

Isognomon isognomum has 1) high shell up to 90 mm, with subparallel anterior and posterior margins, 2) hinge line usually longer than shell length and 3) large nacreous area. The related *Isognomon legumen* (Gmelin, 1791) differs in having wider non nacreous area and shorter hinge line.

DISTRIBUTION AND HABITAT. *Isognomon isognomum* is widely distributed in the Indo-Pacific, from the Red Sea to Australia, Indonesia and northward to Japan. It is an epibyssate element that attaches to rocks, dead coral and coral rubble in the intertidal zone and down to 20 m depth (BERNARD et al., 1993). Previous records in Thai waters were from shelly bottoms and reef flats at depths not exceeding 20 m (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: none recorded.

Superfamily PINNOIDEA

Family *PINNIDAE*

Pinna bicolor Gmelin, 1791

Pl. 4, fig. 7

1909 *Pinna attenuata* - Lynge, p. 149.
1909 *Pinna nutica* - Lynge, p. 149.
1960 *Pinna atropurpurea* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 59, fig. 50.
1960 *Pinna attenuata* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 62, fig. 52.
? 1960 *Pinna bullata* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 64, fig. 53.
1961 *Pinna bicolor* - Rosewater, p. 193, pls. 147-153.
1968 *Pinna bicolor* - Habe, p. 171, pl. 52, fig. 2.
1968 *Pinna curva* (sic) - Habe, p. 171, pl. 52, fig. 8.
1971 *Pinna (Cyrtopinna) bicolor* - Kuroda, Habe & Oyama, p. 353, pl. 76, fig. 1.
1976a *Pinna bicolor* - Nielsen, p. 3, fig. 14.
1979 *Pinna bicolor* - Kay, p. 515, fig. 165 B (not fig. 165 A).
1982 *Pinna bicolor* - Abbott & Dance, p. 300, fig. in top row, middle.
1984 *Pinna muricata* - Sharabati, pl. 39, figs. 2, 2a, 2c (not fig. 2b).
1986 *Pinna bicolor* - Springsteen & Leobrera, p. 318, pl. 90, fig. 11.
1991 *Pinna bicolor* - Abbott, p. 91, pl.47, fig. 2.
1992 *Pinna bicolor* - Lamprell & Whitehead, n. 26, pl. 5, fig. 26.
1992 *Pinna bicolor* - Oliver, p. 58, pl. 8, fig. 1.
1992 *Pinna bicolor* - Dharma, p. 82, pl. 19, fig. 6.
1995 *Pinna bicolor* - Bosch, Dance, Moolenbeek & Oliver, p. 222, fig. 980.
1995 *Pinna bicolor* - Kubo & Kurozumi, p. 157, fig. 2.

Distinctive features are 1) attenuately triangular, thin shell up to 500 mm in length, 2) posterior margin obliquely rounded, 3) sculpture of 9-10 radial riblets over the dorsal half and of broad commarginal folds ventral to the longitudinal keel. Some variability is noted, in fact the shell shape may be attenuately to broadly triangular and the posterior margin variously rounded to nearly truncate.

DISTRIBUTION AND HABITAT. *Pinna bicolor* is a widely ranging species distributed throughout the Indo-Pacific, from South Africa to Hawaii. It occurs embedded in mud or sand, intertidally and down to 10 m depth (ROSEWATER, 1961; BERNARD et al., 1993). Previous records in Thai waters were from intertidal and infralittoral muddy sand (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Quaternary of Australia (sub *Pinna inermis*).

Atrina (Atrina) vexillum (Born, 1778)

1858 *Pinna hystrix* Hanley, p. 226.
1909 *Pinna hystrix* - Lynge, p. 148.
1928 *Pinna (Atrina) vexillum* - Lamy, p. 354.
1932 *Pinna (Atrina) vexillum* - Prashad, p. 135.
1932b *Pinna vexillum* - Lamy, p. 901.
1939 *Pinna (Atrina) vexillum* - Adam & Leloup, p. 55.
1951 *Atrina (Atrina) vexillum* - Habe, p. 66, fig. 128.
1953b *Atrina vexillum* - Habe, p. 187, pl. 27, fig. 11.
1956 *Pinna (Atrina) vexillum* - Satyamurti, p. 56, pl. 8, fig. 3.
1960 *Pinna (Atrina) vexillum* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 68, fig. 57.
1961 *Atrina (Atrina) vexillum* - Rosewater, 204, pl. 139, fig. 3, 4; pls. 156, 157.
1968 *Atrina vexillum gouldi* - Habe, p. 171, pl. 52, fig. 7.
1969 *Atrina vexillum* - Treatise I. P., p. N283, fig. C23 (4).
1976 *Atrina vexillum* - Lindner, p. 216, pl. 53, fig. 6.
1977 *Atrina (Atrina) vexillum* - Habe, p. 66, pl. 12, fig. 5.
1978 *Atrina vexillum* - Kirtisinghe, p. 21, pl. 7, fig. 2.
1979 *Atrina vexillum* - Kay, p. 515, fig. 165B.
1982 *Atrina vexillum* - Abbott & Dance, p. 300, fig. in lower row, middle.
1984 *Atrina vexillum* - Sharabati, pl. 41, figs. 2-2b.
1986 *Atrina (Atrina) vexillum* - Springsteen & Leobrera, p. 318, pl. 90, fig. 10.
1991 *Atrina vexillum* - Abbott, p. 91, pl. 44, fig. 4.
1992 *Atrina vexillum* - Dharma, p. 82, pl. 19, fig. 4.
1992 *Atrina (Atrina) vexillum* - Oliver, p. 57, pl. 8, fig. 3.
1992 *Atrina (Atrina) vexillum* - Lamprell & Whitehead, pl. 5, fig. 30.
1994 *Atrina vexillum* - Coulombel, p. 119, figs. in the same page.
1995 *Atrina vexillum* - Bosch, Dance, Moolenbeek & Oliver, p. 224, fig. 982.
1995 *Atrina vexillum* - Kubo & Kurozumi, p. 156, top fig.; p. 157, fig. 1.

Atrina vexillum is distinguished by 1) ttiangular or roundly-triangular shell attaining 480 mm in length, 2) high posterior side and 3) truncate to broadly atched posteriot matgin.

DISTRIBUTION AND HABITAT. The species is widely distributed in the Indo-Pacific. It occurs in sand and mud intertidally and down to 50 m (BERNARD et al., 1993). In western Thai waters *Atrina vexillum* was noted to occur in sand land-ward of coral reefs (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Doubtful records from Late Miocene to Pleistocene of Indonesia.

Atrina (Servatrina) pectinata (Linnaeus, 1767)
Pl. 4, fig. 8

1909 *Pinna inflata* - Lynge, p. 148.
1932b *Pinna pectinata* - Lamy, p. 899.
1932 *Pinna (Atrina) pectinata* - Prashad, p. 137.
1953b *Atrina (Servatrina) pectinata* - Habe, p. 191, pl. 24, fig. 4.
1960 *Pinna (Atrina) pectinata* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 65, fig. 54.
1961 *Atrina (Servatrina) pectinata* - Rosewater, p. 211, pl. 139, fig. 5, 6; pls. 161-164.
1965 *Atrina (Servatrina) pectinata* - Kira, p. 132, pl. 47, fig. 10.
1968 *Atrina (Servatrina) pectinata* - Habe, p. 171, pl. 52, fig. 5.
1971 *Atrina (Servatrina) pectinata japonica* - Kuroda, Habe & Oyama, p. 353, pl. 76, figs. 2-4.
1977 *Atrina (Servatrina) pectinata* - Habe, p. 66, pl. 12, figs. 2, 3.
1978 *Atrina pectinata* - Kirtisinghe, p. 21, pl. 7, figs. 3, 4.
1980 *Atrina (Servatrina) pectinata* - Wu, p. 104, pl. 2, fig. F.
1981 *Atrina (Servatrina) pectinata* - Poutiers, p. 331.
1982 *Atrina pectinata* - Abbott & Dance, p. 300, fig. in middle lower row, middle.
1986 *Atrina (Servatrina) pectinata pectinata* - Springsteen & Leobrera, p. 317, pl. 90, figs. 6, 7.
1991 *Pinna pectinata* - Abbott, p. 91, pl. 47, fig. 3.
1992 *Atrina (Servatrina) pectinata* - Oliver, p. 57, pl. 8, fig. 4.
1992 *Atrina (Servatrina) pectinata* - Lamprell & Whitehead, pl. 6, fig. 32.
1995 *Servatrina pectinata* - Bosch, Dance, Moolenbeek & Oliver, p. 224, fig. 983.

Atrina pectinata is easily tecognized on account of 1) thin shell up to 370 mm in length, 2) triangular anterior part, squared posterior part, 3) rounded postero-ventral angle and 4) sculpture of 15-30 radial tibs on mid-dotsal part, ventral side with commarginal wavy, low folds. *Atrina pectinata zelandica* (Gray, 1835) differs in having lower, distinctly triangular shell, radially ribbed throughout.

DISTRIBUTION AND HABITAT. The species is disttibuted in the Indian and West Pacific oceans, from the Red Sea to Australia and northward to Japan. *Atrina pectinata* dwells on sandy or muddy substrates ftom the intertidal zone to 500 m depth (BERNARD et al., 1993). It survives a range of temperatures from 1°C to 39°C and is resistant to seawater with lowered salinity (ROSEWATER, 1961). In western Thai watets the species was recovered embedded in sand landward of coral reefs (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Pliocene and Quaternary of Japan; Holocene of Thailand.

Superfamily LIMOIDEA
Family *LIMIDAE*

Limaria (Limaria) basilanica (Adams & Reeve, 1850)
Pl. 4, fig. 9

1909 *Lima (Mantellum) angulata* - Lynge, p. 159.
1932 *Lima (Limaria) orientalis* - Prashad, p. 125, pl. 3, figs. 32, 33.
1951 *Promantellum basilanicum* - Habe, p. 89, figs. 174, 175.
1954 *Limea (Promantellum) hakodatensis* - Taki & Oyama, pl. 13, fig. 12 (not *Lima hakodatensis* Tokunaga, 1906).
1960 *Lima basilanica* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 87, fig. 72.
1965 *Limaria hakodatensis* - Kira, p. 145, pl. 53, fig. 2 (not *Lima hakodatensis* Tokunaga, 1906).
1968 *Mantellum basilanicum* - Habe, p. 176, pl. 54, fig. 9.
1971 *Limaria (Limaria) basilanica orientalis* - Kuroda, Habe & Oyama, p. 375, pl. 118, fig. 2.
1977 *Limaria (Limaria) basilanica* - Habe, p. 103, pl. 19, figs. 10, 11.
1978 *Limaria orientalis* - Cernohorsky, p. 180, pl. 64, figs. 5, 5a.
1978 *Limaria basilanica* - Cernohorsky, p. 180, pl. 64, fig. 6.
1982 *Limaria basilanica* - Abbott & Dance, p. 319, fig. in lower mid row, middle.
1986 *Limaria basilanica* - Takayasu, pl. 81, figs. 5, 9.
1986 *Limaria orientalis* - Springsteen & Leobrera, p. 302, pl. 86, fig. 5.
1992 *Limaria basilanica* - Dharma, p. 88, pl. 22, fig. 5.
1992 *Limaria (Limaria) basilanica* - Lamprell & Whitehead, pl. 17, fig. 98.
1995 *Limaria basilanica* - Kubo & Kurozumi, p. 168, bottom fig.; p. 169, fig. 5.

Limaria basilanica is featuted by 1) thin, tather convex, stoutly oval oblique shell up to 40 mm in height and 2) 35 to ovet 50 uneven radial riblets crossed by more or less distinct commarginal threads. We concur with LAMY (1930), ABBOTT & DANCE (1982) and BERNARD et al. (1993) in considering *Lima orientalis* Adams & Reeve, 1850 as a synonym of *Limaria basilanica*. The Japanese Pliocene to Recent *Limaria hakodatensis* (Tokunaga, 1906) is closely related but differs in having a somewhat higher shell with a subangular posterior margin.

DISTRIBUTION AND HABITAT. *Limaria basilanica* ranges in the West Pacific, from Australia to Japan. It is an epibyssate element that attaches to hard substrates intertidally and down to 20 m depth (ABBOTT & DANCE, 1982; BERNARD et al., 1993). Previous records in the Gulf of Thailand were from coarse sand, stones, shells and coral blocks at depths of from 2 to 54 m (LYNGE, 1909 sub *Lima angulata*).

FOSSIL RECORDS: Pliocene and Quatetnary of Japan; Holocene of Thailand.

Limaria (Limaria) fragilis (Gmelin, 1791)
Pl. 4, fig. 10

1909 *Lima (Mantellum) fragilis* - Lynge, p. 158.
1930 *Lima (Mantellum) fragilis* - Lamy, p. 169.
1932 *Lima (Limaria) fragilis* - Prashad, p. 124.
1960 *Lima fragilis* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 88, fig. 73.
1965 *Limaria fragilis* - Kira, p. 145, pl. 53, fig. 3.
1972 *Limea fragilis* - Cernohorsky, p. 220, pl. 62, fig. 1.
1979 *Lima fragilis* - Kay, p. 534, fig. 172.
1982 *Limaria fragilis* - Abbott & Dance, p. 319, fig. in lower mid row, right.
1984 *Limaria (Platilimaria) fragilis* - Matsukuma, p. 12, pl. 2, fig. 4.
1990 *Lima fragilis* - Wells, Bryce, Clark & Hansen, p. 83, pl. 77, fig. 361.
1992 *Limaria fragilis* - Dharma, p. 88, pl. 22, fig. 4.
1992 *Limaria fragilis* - Oliver, p. 84, pl. 14, fig. 7.
1992 *Limaria (Limaria) fragilis* - Lamprell & Whitehead, pl. 17, fig. 96.
1995 *Limaria fragilis* - Bosch, Dance, Moolenbeek & Oliver, p. 225, fig. 986.
1995 *Limaria fragilis* - Scott, p. 40, fig. in p. 41.

Limaria fragilis diffets ftom *Limaria basilanica* (Adams & Reeve, 1850) in having 1) oblique subquadrangular, comparatively highet shell with parallel anterior and postero-ventral margins, 2) less numerous (up to 30), somewhat scaly radial riblets and 3) early gtowth stages nearly smooth except for 3-4 incipient ribs.

DISTRIBUTION AND HABITAT. The species is widespread in the Indo-Pacific, from South Africa to Japan, Polinesia and Hawaii

(LYNGE, 1909; KAY, 1979; REHDER, 1980). It dwells on different substrates, primarily rocks, gravel and coral rubble, from the intertidal zone down to 20 m (WELLS et al., 1990; BERNARD et al., 1993). Like other limids, *Limaria fragilis* attaches by byssus, but can release it and swim when disturbed (PURCHON & PURCHON, 1981; OLIVER, 1992). *Limaria fragilis* was reported to occur in the Gulf of Thailand on infralittoral sandy and muddy substrates (LYNGE, 1909); up to date records are from muddy bottoms 60-70 m deep (SCOTT, 1995).

FOSSIL RECORDS: Holocene of Thailand.

Superfamily OSTREOIDEA
Family *OSTREIDAE*
Subfamily *Ostreinae*

Ostrea (Ostrea) denselamellosa Lischke, 1869
Pl. 5, fig. 1

1929 *Ostrea denselamellosa* - Lamy, p. 36.
1933 *Ostrea denselamellosa* - Nomura, p. 46, pl. 4, fig. 6.
1936a *Ostrea denselamellosa* - Lamy, p. 427.
1951 *Ostrea (Ostrea) denselamellosa* - Habe, p. 94, figs. 187, 188.
1954 *Ostrea denselamellosa* - Taki & Oyama, pl. 16, figs. 1, 2.
1958 *Ostrea denselamellosa* - Makiyama, pl. 55, fig. 11.
1960 *Ostrea denselamellosa* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 95, fig. 78.
1961 *Ostrea (Ostrea) denselamellosa* - Hayasaka, p. 34.
1965 *Ostrea denselamellosa* - Kira, p. 144, pl. 52, fig. 1.
1971 *Ostrea denselamellosa* - Kuroda, Habe & Oyama, p. 381, figs. 2, 3.
1977 *Ostrea denselamellosa* - Habe, p. 110, pl. 20, fig. 5.
1986 *Ostrea denselamellosa* - Sato, Masuda & Shuto, p. 28, pl. 3, fig. 5.
1986 *Ostrea denselamellosa* - Takayasu, pl. 81, fig. 18.

A few juvenile right valves are in hand, featured by 1) subcircular outline, 2) small ostreine chomata on both sides of ligament area and 3) flat outer surface with embricated commarginal lamellae bearing scattered radial lines. The Thai specimens perfectly conform to the earlier growth stages of the shell figured by KIRA (1965; pl. 52, fig. 1). A superficial resemblance to *Parahyotissa numisma* (Lamarck, 1819) is noted, but that species has vermiculate chomata and vesicular structure.

DISTRIBUTION AND HABITAT. The species was hitherto reported to range from Vietnam to Japan. It occurs intertidally and down to 20 m depth on hard substrates (BERNARD et al., 1993).

FOSSIL RECORDS: Pliocene of Taiwan and Japan; Quaternary of Japan.

Planostrea pestigris (Hanley, 1845)
Pl. 5, fig. 2

1845a *Ostrea pes-tigris* Hanley, p. 106.
1869 *Ostrea paulucciae* Crosse, p. 188.
1870 *Ostrea paulucciae* - Crosse, p. 108, pl. 2, fig. 5.
1885 *Ostrea disciformis* Martin, p. 273, pl. 14, fig. 275.
1909 *Ostrea disciformis* - Martin, p. 335, pl. 46, figs. 5, 6.
1909 *Ostrea paulucciae* - Lynge, p. 162.
1920 *Ostrea disciformis* - Tesch, p. 86, pl. 134, figs. 234, 235.
1929 *Ostrea paulucciae* - Lamy, p. 141.
1929 *Ostrea pes-tigris* - Lamy, p. 142.
1935 *Ostrea (Ostrea) paulucciae* - Oostingh, p. 143.
1960 *Ostrea (Crassostrea) paulucciae* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 112, fig. 93.
Not 1960 *Ostrea (Crassostrea) pes-tigris* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 113, fig. 94.
Not 1961 *Ostrea (Crassostrea) pes-tigris* - Hayasaka, p. 35, pl. 3, fig. 8-10.
1985 *"Ostrea" pestigris* - Morris, p. 128, pl. 4, figs. A-D.
1985 *Planostrea pestigris* - Harry, p. 143, fig. 22.
Not 1994 *Ostrea pestigris* - Scott, p. 68, pl. 5, fig. B.
1998 *Planostrea pestigris* - Lamprell & Healy, p. 134, fig. 333.

This oyster is distinguished by 1) moderately inequivalve, subplanar, trigonal-ovate shell up to 75 mm in height, 2) wide, flat commissural shelf in left valve, 3) ostreine chomata arranged into 2 diverging rows, often reaching midshell, 4) left valve sculptured with narrow, cord-like, discontinuous, occasionally bifurcating radial ribs, 5) surface of both valves pale violet with darker radial rays. *Ostrea paulucciae* Crosse, 1869 is currently regarded as a synonym of Hanley species. The fossil Indonesian *Ostrea disciformis* Martin, 1885 seems to be undistinguishable from *Planostrea pestigris*.

DISTRIBUTION AND HABITAT. The species occurs uncommonly from Mauritius to Australia and northward to Japan. It lives in the intertidal zone and down to 10 m on rocks and corals (BERNARD et al., 1993). According to HARRY (1985), *Planostrea pestigris* may occasionally occur at low tide, but most specimens have been dredged from a few to 100 m depth. LYNGE (1909) found the species (sub *Ostrea paulucciae*) in the Gulf of Thailand on infralittoral mud or muddy sand.

FOSSIL RECORDS: Late Miocene of Indonesia; Pliocene of Indonesia and Japan; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Subfamily *Crassostreinae*

Crassostrea gigas (Thunberg, 1793)
Pl. 5, fig, 3

1929 *Ostrea gigas* - Lamy, p. 37.
1951 *Ostrea (Crassostrea) gigas* - Habe, p. 95, fig. 192.
1954 *Ostra (Crassostrea) gigas* - Taki & Oyama, pl. 16, figs. 3, 4; pl. 17, fig. 6.
1954 *Crassostrea gigas* - Thomson, p. 158, pl. 8, fig. 4; pl. 9, figs. 1-4; pl. 10, fig. 1.
1959 *Ostrea gigas* - Makiyama, pl. 74, fig. 1.
1960 *Ostrea gigas* - Makiyama, pl. 101, figs. 2, 3.
1960 *Ostrea (Crassostrea) gigas* - Hayasaka, p. 364, pls. 37, 38.
1960 *Ostrea gigas* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 108, fig. 90.
1961 *Ostrea (Crassostrea) gigas* - Hayasaka, p. 34.
1965 *Crassostrea gigas* - Kira, p. 144, pl. 52, figs. 3, 8.
1971 *Crassostrea gigas* - Kuroda, Habe & Oyama, p. 382, pl. 86, fig. 1.
1973 *Ostrea (Crassostrea) gigas* - Noda, pl. 5, fig. 6.
? 1974 *Crassostrea* cf. *gigas* - Ghisotti, p. 14, pl. 1, fig. 11.
1977 *Crassostrea gigas* - Habe, p. 108, pl. 20, fig. 6.
1979 *Crassostrea gigas* - Kay, p. 535, fig. 173H.
1980 *Crassostrea gigas* - Wu, p. 107, pl. 2, fig. H.
1980 *Crassostrea gigas* - Volova & Scarlato, p. 35, fig. 26.
1982 *Crassostrea gigas* - Abbott & Dance, p. 318, fig. in lower mid row, left.
1983 *Crassostrea gigas* - Chonglakmani, Ingavat, Piccoli & Robba, p. 345, pl. 2, fig. 1.
1985 *Crassostrea gigas* - Morris, p. 123, pl. 2, figs. A-F.
1985 *Crassostrea gigas* cf. *angulata* - Cesari & Pellizzato, p. 251, pl., figs. 1-3.
1986 *Crassostrea gigas* - Sato, Masuda & Shuto, p. 29, pl. 3, fig. 6.
1986 *Crassostrea gigas* - Takayasu, pl. 61, fig. 13.
1986 *Crassostrea gigas* - Springsteen & Leobrera, p. 317, pl. 90, fig. 4.
1990 *Crassostrea gigas* - Masuda, Handa, Kanno, Miyasaka, Nemoto, Sasaki, Takaizumi & Wako, pl. 1, fig. 2.
1993 *Crassostrea gigas* - Noda, Kikuchi & Nikaido, p. 145, fig. 16 (8).
1995 *Crassostrea gigas* - Kubo & Kurozumi, p. 171, fig. 3.
1998 *Crassostrea gigas* - Lamprell & Healy, p. 136, fig. 340.

This is a most distinctive oyster, readily recognized on the basis of 1) large, thick, oval to slender-spatulate shell attaining 500 mm in

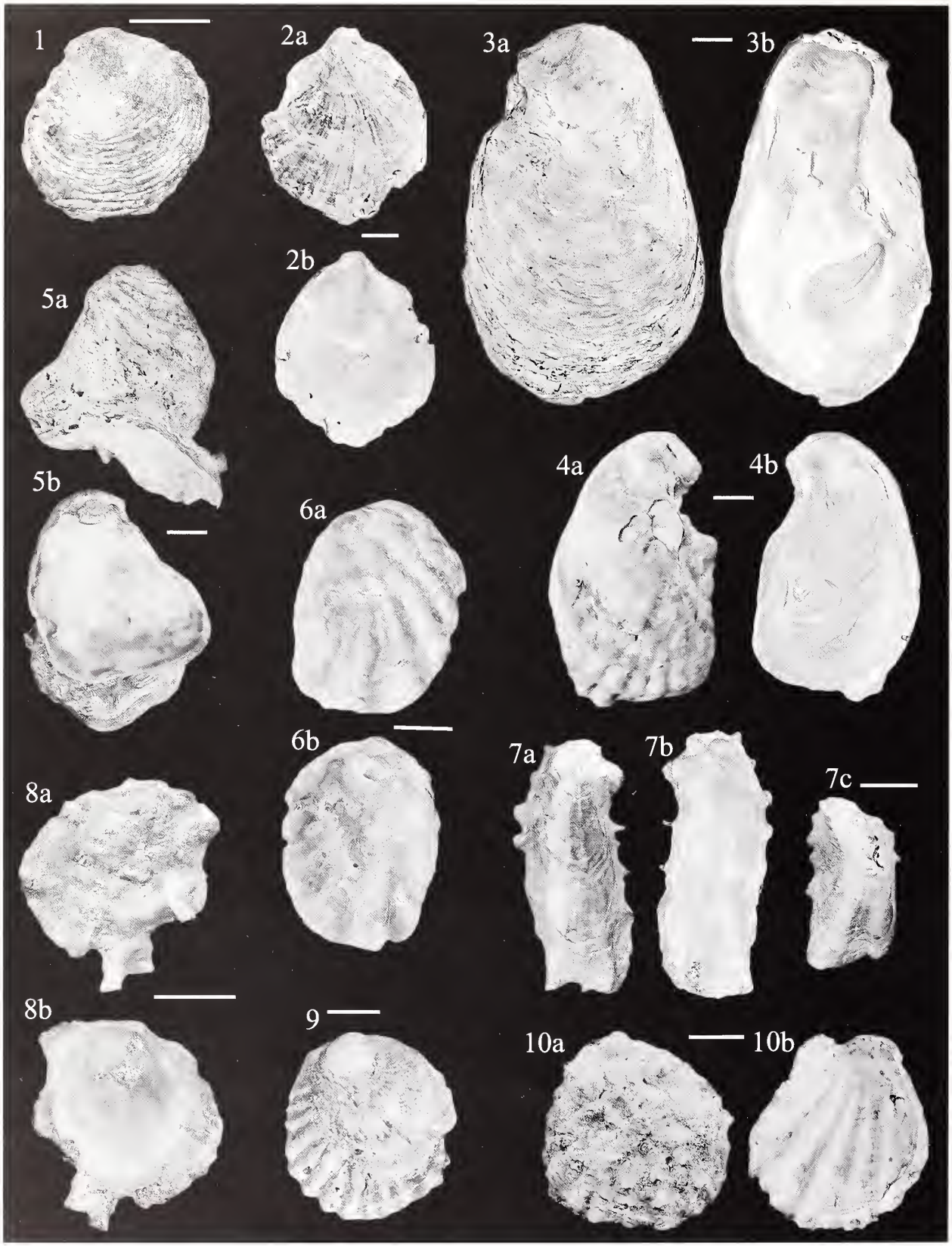

Plate 5: Fig. 1. *Ostrea (Ostrea) denselamellosa* Lischke, 1869, Station TH 20; scale bar 10 mm. Figs. 2a, 2b. *Planostrea pestigris* (Hanley, 1845), Station TH 20; scale bar 10 mm. Figs. 3a, 3b. *Crassostrea gigas* (Thunberg, 1793), Wat Hoi, Holocene; scale bar 20 mm. Figs. 4a, 4b. *Saccostrea cucullata* (Born, 1778), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 5a, 5b. *Alectryonella haliotidaea* (Lamarck, 1819), Station TH 108; scale bar 10 mm. Figs. 6a, 6b. *Dendostrea folium* (Linnaeus, 1758), trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Figs. 7a, 7b, 7c. *Dendostrea rosacea* (Deshayes, 1836), Station TH 15; scale bar 10 mm. Figs. 8a, 8b. *Hyotissa hyotis* (Linnaeus, 1758), Station TH 52; scale bar 10 mm. Fig. 9. *Plicatula (Plicatula) chinensis* Mörch, 1853, trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Figs. 10a, 10b. *Plicatula (Plicatula) muricata* Sowerby, 1873, Ban Praksa, level BTN 2, Holocene; scale bar 10 mm.

height, 2) broad, higher than wide ligament area and 3) surface with growth lamellae.

DISTRIBUTION AND HABITAT. *Crassostrea gigas* is distributed in the Indo-West Pacific, from Pakistan to Western Indonesia, Japan and further northward to Korea and Sakalin Peninsula; it has been introduced in other areas where is cultured as a food source. The species is a predominantly intertidal element found attached to hard substrates (KAY, 1979; BERNARD et al., 1993) and well adapted to live in somewhat brackish waters (KIRA, 1965). According to HAYASAKA (1961), the large and elongated type that cluster to form oyster banks, should be restricted to closed embayments with the influence of fresh water. MORRIS (1985) reported that *Crassostrea gigas* living in Hong Kong Bay occurs on mud flats in estuarine conditions. TANTANASIRIWONG (1979) recorded the species in western Thai waters, attached in crevices of *Porites lutea*, at a depth of 2 m.

FOSSIL RECORDS: Miocene of Japan; Pliocene of Taiwan and Japan; Quaternary of Japan; Holocene of Thailand.

Saccostrea cucullata (Born, 1778)

Pl. 5, fig. 4

1909 *Ostrea cucullata* var. *barclayana* - Lynge, p. 160.
1927 *Ostrea cucullata* var. *barclayana* - Cox, p. 38, pl. 3, fig. 3.
1929 *Ostrea cucullata* - Cox, p. 178.
1960 *Ostrea cucullata* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 104, fig. 86.
1971 *Saccostrea cucullata* - Treatise I. P., p. N1134, figs. J104 (1), J105 (1-4), J106 (1).
1976a *Saccostrea cucullata* - Nielsen, p. 4, fig. 41.
1978 *Saccostrea cucullata* - Cernohorsky, p. 182, pl. 66, fig. 4.
1981 *Crassostrea cucullata* - Richards, p. 82, pl. 51, fig. 462.
1981 *Ostrea (Lopha) cucullata* - Eisenberg, p.157, pl. 139, fig. 17.
1982 *Ostrea cucullata* - Bosch & Bosch, p. 166, middle fig.
1982 *Saccostrea cucullata* - Abbott & Dance, p. 318, fig. in bottom row, left.
1985 *Saccostrea cucullata* - Morris, p. 125, pl. 3, figs. A-G.
1989 *Ostrea cucullata* - Bosch & Bosch, p. 86, upper mid fig.
1990 *Saccostrea cucullata* - Taylor, p. 849, pl. 1; text-figs. 11-13.
1990 *Saccostrea cucullata* - Wells, Bryce, Clark & Hansen, p. 83, pl. 77, fig. 362.
1992 *Saccostrea cucullata* - Oliver, p. 91, pl. 17, figs. 1-3.
1992 *Saccostrea cucullata* - Dharma, p. 86, pl. 21, fig. 15.
1995 *Saccostrea cucullata* - Bosch, Dance, Moolenbeek & Oliver, p. 228, fig. 996.
1998 *Saccostrea cucullata* - Lamprell & Healy, p. 134, fig. 336.

Saccostrea cucullata is a well known species that may grow to 90 mm in heigth. The fossil specimens recovered from the Bangkok Clay conform to the rudistiform ecomorph and are characterized by 1) cornucopia-like shell, 2) high ligamental area, 3) distinct umbonal cavity and 4) coarse radial folds.

DISTRIBUTION AND HABITAT. The species exhibits a quite wide distribution, ranging from the tropical coasts of West Africa into the Indo-Pacific to Australia, New Zealand and northward to Japan. It occurs intertidally and down to 5 m depth, attached to rocks and other firm substrates like mangrove roots (HARRY, 1985; BERNARD et al., 1993). *Saccostrea cucullata* is adapted to wide fluctuations of salinity and is a common dweller of the mangrove forest where dense populations may be found on roots (SASEKUMAR, 1974; TANTANASIRIWONG, 1979; PLAZIAT, 1984; MORTON & CHAN, 1990). In the Gulf of Thailand it was recorded from intertidal stones (LYNGE, 1909).

FOSSIL RECORDS: Miocene of Indonesia; Pliocene of Red Sea area, Indonesia, Philippines, Taiwan and Japan; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Subfamily *Lophinae*

Alectryonella haliotidaea (Lamarck, 1819)

Pl. 5, fig. 5

1929 *Ostrea crenulifera* - Lamy, p. 250.
1954 *Lopha (Dendostrea) crenulifera* - Taki & Oyama, pl. 42, figs. 1-4.
1960 *Ostrea (Lopha) crenulifera* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 105, fig. 87.
1982 *Alctryonella plicatula* - Bosch & Bosch, p. 166, top fig.
1984 *Alectryonella crenulifera* - Sharabati, pl. 43, figs. 4-4c.
1985 *Alectryonella haliotidaea* - Morris, p. 130, pl. 5, figs. A-G.
1992 *"Alectryonella" crenulifera* - Oliver, p. 90, pl. 16, fig. 6.
1994 *Alectryonella haliotidaea* - Scott, p. 70, pl. 5, fig. C.
1995 *Alectryonella crenulifera* - Bosch, Dance, Moolenbeek & Oliver, p. 227, fig. 994.

The species is featured by 1) variously shaped shell attaining 55 mm in size, 2) large attachment area, 3) right valve flat to rather convex, 4) more or less wavy margins, 5) poorly developed chomata, 6) adductor scar with straight or slightly concave upper border, 7) sculpture of rounded, occasionally bifurcating radial ribs on both valves. Umbonal tubercles and/or inner granules are noted in some specimens. According to MORRIS (1985), *Ostrea crenulifera* Sowerby, 1871 is a synonym of the present species.

DISTRIBUTION AND HABITAT. *Alectryonella haliotidaea* ranges from the Red Sea to Australia and as far north as Japan. It occurs attached to rocks and corals, intertidally and down to 25 m depth (BERNARD et al., 1993).

FOSSIL RECORDS: Quaternary of Japan (sub *Lopha crenulifera*).

Dendostrea folium (Linnaeus, 1758)

Pl. 5, fig. 6

1954 *Lopha (Dendostrea) folium* - Taki & Oyama, pl. 41, figs. 12, 13.
1954 *Ostrea folium* - Thomson, p. 146, pl. 2, figs. 3, 4; pl. 3, figs. 1-4.
1956 *Ostrea folium* - Satyamurti, p. 69, pl. 11, fig. 3.
1960 *Ostrea (Lopha) folium* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 99, fig. 82.
1968 *Dendrostrea folium* - Habe, p. 176, pl. 54, fig. 14.
1971 *Lopha (Lopha) folium* - Treatise I. P, p. N1157, figs. 47, 130.
1978 *Lopha folium* - Cernohorsky, p. 182, pl. 66, fig. 2.
1984 *Dendrostrea folium* - Sharabati, pl. 41, fig. 4.
1985 *Dendostrea folium* - Harry, p. 137,138, figs. 17, 18.
1986 *Lopha cristagalli* form *folium* - Springsteen & Leobrera, p. 316, pl. 89, fig. 9.
1990 *Dendostrea folium* - Wells, Bryce, Clark & Hansen, p. 83, pl. 77, fig. 363.
1992 *Dendrostrea frons* - Oliver, p. 90, pl. 16, fig. 5.
1992 *Lopha folium* - Dharma, p. 86, pl. 21, fig. 14.
1994 *Dendrostrea frons* - Coulombel, p. 124, figs. in same page.
1995 *Dendrostrea frons* - Bosch, Dance, Moolenbeek & Oliver, p. 226, fig. 992.
1995 *Dendostrea folium* - Kubo & Kurozumi, p. 171, fig. 2.
1998 *Dendostrea folium* - Lamprell & Healy, p. 132, fig. 328.

The species, which may attain 100 mm in length, is distinguished on the basis of its rounded to V-shaped, more or less scaly radial ribs and variously developed claspers on left valve. As already pointed out by OLIVER (1992), LINNAEUS (1758) quoted his species *Ostrea folium* and *Mytilus frons* respectively from Jamaica (p. 699) and from the Indian Ocean (p. 704). Should this geographic allocation prove to be correct, the Indo-Pacific species is to be named *Dendostrea frons* (Linnaeus, 1758) and, conversely, the Caribbean one *Dendostrea folium* (Linnaeus, 1758).

DISTRIBUTION AND HABITAT. *Dendostrea folium* is distributed throughout the tropical Indo-Pacific. It occurs intertidally and subtidally on rocks (BERNARD et al., 1993). According to HABE (1968), the species is found in Japanese waters at depths of 50-300

m. TANTANASIRIWONG (1979) observed *Lopha folium* cemented on stems of gorgonaceans at 26 m depth in western Thai waters.
FOSSIL RECORDS: Early Miocene of India; Miocene of East Africa, Indonesia and Japan; Pliocene of Indonesia, Philippines, Taiwan and Japan; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Dendostrea rosacea (Deshayes, 1836)
Pl. 5, fig. 7

1845a *Ostrea chemnitzii* Hanley, p. 106.
1929 *Ostrea plicatula* var. *rosacea* - Lamy, p. 83.
1929 *Ostrea plicatula* var. *chemnitzi* - Lamy, p. 84.
1960 *Ostrea (Crassostrea) pes-tigris* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 113, fig. 94.
1961 *Ostrea (Crassostrea) pes-tigris* - Hayasaka, p. 35, pl. 3, figs. 8-10.
1971 *Saxostrea chemnitzi* - Kuroda, Habe & Oyama, p. 380, pl. 85, figs. 3-5.

This is a poorly known, often mistaken species. The main characters are 1) thin, small shell up to 50 mm in height, 2) rather variable outline, from oval to crescentic to slender-spatulate with subparallel anterior and posterior margins, 3) oval, dorso-ventrally elongated adductor scar, 4) sculpture of few, slender radial ribs often developing close to the margins and projecting well beyond them; hollow hyotal spines are noted on ribs; surface uniformly violet with darker radial rays. *Ostrea trapezina* Lamarck, 1819 seems to be strictly related and could be a senior synonym.
DISTRIBUTION AND HABITAT. *Dendostrea rosacea* is distributed in the Southwest Pacific, from Philippines to South China Sea and Japan. According to BERNARD et al. (1993), it occurs on corals in the intertidal zone and down to 5 m depth. HAYASAKA (1961) reported the species to form clusters on pebbles on the coastal bottom. Large clusters up to 1 m in diameter were noted in living position within the Bangkok Clay at Ban Dong Tan.
FOSSIL RECORDS: Quaternary of Japan; Holocene of Thailand (sub *Crassosstrea pestigris*).

Family *GRYPHAEIDAE*
Subfamily *Pycnodonteinae*

Hyotissa hyotis (Linnaeus, 1758)
Pl. 5, fig. 8

? 1909 *Ostrea hyotis* var. *imbricata* - Lynge, p. 161.
1927 *Ostrea hyotis* - Cox, p. 35, pl. 3, fig. 1.
1929 *Ostrea hyotis* - Lamy, p. 233.
1932 *Ostrea (Lopha) hyotis* - Prashad, p. 129.
1933 *Ostrea hyotis* - Nomura, p. 48, pl. 2, fig. 11.
1954 *Pycnodonte hyotis* - Thomson, p. 159, pl. 10, figs. 2-4; pl. 11, figs. 1-3.
1960 *Ostrea hyotis* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 96, fig. 79.
1965 *Dendostraea hyotis* - Kira, p. 144, pl. 52, fig. 2.
1971 *Hyotissa hyotis* - Treatise I. P., p. N1108, fig. J85.
1976a *Hyotissa hyotis* - Nielsen, p. 4, fig. 40.
1977 *Hyotissa hyotis* - Habe, p. 107.
1978 *Hyotissa hyotis* - Cernohorsky, p. 182, pl. 66, fig. 3.
1978 *Dendrostraea hyotis* - Kirtisinghe, p. 26, pl. 11, fig. 6.
1981 *Ostrea (Lopha) hyotis* - Eisenberg, p. 157, pl. 139, fig. 19.
1982 *Hyotissa hyotis* - Bosch & Bosch, p. 166, bottom fig.
1982 *Hyotissa hyotis* - Abbott & Dance, p. 318, fig in upper row, right.
1984 *Hyotissa hyotis* - Sharabati, pl. 42, figs. 1-1b.
1985 *Hyotissa hyotis* - Harry, p. 130, figs. 10, 11.
1991 *Hyotissa hyotis* - Abbott, p. 94, pl. 46, fig. 7.
1992 *Hyotissa hyotis* - Dharma, p. 86, pl. 21, fig. 17.
1992 *Hyotissa hyotis* - Oliver, p. 89, pl. 16, fig. 2.
1994 *Hyotissa hyotis* - Coulombel, p. 123, left figs.
1995 *Hyotissa hyotis* - Bosch, Dance, Moolenbeek & Oliver, p. 228, fig. 999.
1998 *Hyotissa hyotis* - Lamprell & Healy, p. 130, fig. 322.

Hyotissa hyotis exhibits 1) moderately inequivalve, irregularly oval shell attaining 280 mm in height, 2) distinct vesicular structure, 3) vermiculate chomata well developed on both sides of the ligament area, 4) adductor scar oval, dorsally excavated, 5) sculpture of prominent, angular radial ribs bearing hyotal spines. *Ostrea imbricata* Lamarck, 1819 was included by HARRY (1985) in his new genus *Parahyotissa* and, accordingly, appears to be quite distinct from *Hyotissa hyotis*. LYNGE (1909) quoted *Ostrea imbricata* from the Gulf of Thailand, but did not provide any description. In this circumstance, it remains uncertain whether those specimens really belong to Lamarck species or to *Hyotissa hyotis*.
DISTRIBUTION AND HABITAT. The species is widely distributed in the Indo-Pacific, from the Red Sea to Australia and northward to Japan. According to BERNARD et al. (1993), it is an intertidal and infralittoral element living attached to hard substrates. TANTANASIRIWONG (1979) recovered *Hyotissa hyotis* in western Thai waters, on reef flats between tide marks and down to 5 m depth.
FOSSIL RECORDS: Lower Miocene of Zanzibar; Mid-Late Miocene of India and Indonesia; Pliocene of India, Indonesia and Taiwan; Quaternary of the Indo-Pacific area; Pleistocene of Thailand (35460±1300 B.P., reworked in the Bangkok Clay).

Superfamily PLICATULOIDEA
Family *PLICATULIDAE*

Plicatula (Plicatula) chinensis Mörch, 1853
Pl. 5, fig. 9

1909 *Plicatula imbricata* - Lynge, p. 152.
1932 *Plicatula chinensis* - Prashad, p. 116.
1939 *Plicatula chinensis* - Adam & Leloup, p. 55, pl. 3, fig. 13.
1981 *Plicatula imbricata* - Tes. Conchyl., reprint, p. 437, pl. 91, figs. 6, 15-18.
1982 *Plicatula imbricata* - Bosch & Bosch, p. 161, fig. in the same page.
1989 *Plicatula imbricata* - Bosch & Bosch, p. 85, middle fig.
1998 *Plicatula (Plicatula) chinensis* - Lamprell & Healy, p. 112, fig. 276.

The species is featured by 1) ovate-triangular, moderately inequivalve shell attaining 45 mm in length, 2) antero-dorsal and postero-dorsal margins nearly straight, forming an angle of approximately 70°, 3) ventral margin rather regularly arched, 4) isodont hinge, with elongated teeth, 5) sculpture on both valves of 9-12 strong, angular, scaly radial ribs occasionally bifurcating and 6) small attachment area on right valve, located near the beak.
DISTRIBUTION AND HABITAT. *Plicatula chinensis* is distributed in the Indian and Southwest Pacific oceans. It attaches to rocks in the intertidal zone and down to 20 m (BERNARD et al., 1993). According to LYNGE (1909), the species (sub *Plicatula imbricata*) occurs in the Gulf of Thailand between 9 and 54 m depth on gravel, shells and coral rubble.
FOSSIL RECORDS: Holocene of Thailand.

Plicatula (Plicatula) muricata Sowerby, 1873
Pl. 5, fig. 10

1932 *Plicatula muricata* - Prashad, p. 117.
1951 *Plicatula muricata* - Habe, p. 70, figs. 132-134.
1965 *Plicatula muricata* - Kira, p. 136, pl. 49, fig. 3.
1971 *Plicatula muricata* - Kuroda, Habe & Oyama, p. 359, pl. 84, figs. 1-3.

1977 *Spiniplicatula muricata* - Habe, p. 95, pl. 13, figs. 13-15.
1981 *Plicatula (Plicatula) muricata* - Poutiers, p. 332.
1995 *Plicatula muricata* - Kubo & Kurozumi, p. 169, fig. 8.
1998 *Plicatula (Plicatula) muricata* - Lamprell & Healy, p. 114, fig. 277.

Plicatula muricata resembles *Plicatula chinensis* Mörch, 1853 as regards the shell shape, but is differently sculptured. In fact, has slenderer, more numerous radial ribs bearing hollow spiny processes.
DISTRIBUTION AND HABITAT. The species distributed in Southeast Asian waters and northward to Japan (Honshu). It occurs on sand in the 20-350 m bathymetric interval (BERNARD et al., 1993), attached with the umbonal area to the substrate. According to TANTANASIRIWONG (1979), *Plicatula muricata* was dredged in western Thai waters, from a bottom of muddy sand at a depth of 26 m.
FOSSIL RECORDS: Holocene of Thailand.

Superfamily PECTINOIDEA
Family *PECTINIDAE*
Subfamily *Chlamydinae*

Chlamys (Chlamys) senatoria (Gmelin, 1791)
Pl. 6, fig. 1

1883 *Pecten senatorius* - Martin, p. 237, pl. 11, fig. 33.
1909 *Pecten senatorius* - Lynge, p. 153.
1927 *Chlamys senatoria* - Cox, pp. 45, 75, pl. 7, figs. 1-3; pl. 15, fig. 3; pl. 17, fig. 10.
1929 *Chlamys senatoria* - Cox, p. 191.
1939 *Chlamys senatoria* - Mukerjee, p. 31, pl. 1, fig. 2; pl. 2, figs. 9, 10.
1960 *Chlamys nobilis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 72, fig. 59.
1960 *Pecten senatorius* - Paes da Franca, p. 90, pl. 21, fig. 1.
1964 *Chlamys senatorius* - Spry, p. 15, pl. 2, fig. 71.
1965 *Chlamys (Mimachlamys) nobilis* - Kira, p. 140, pl. 50, fig. 12.
1972 *Chlamys senatoria* - Cernohorsky, p. 217, pl. 7, fig. 3.
1976 *Chlamys (Chlamys) senatoria* - Lindner, pl. 55, figs. 1, 2.
1978 *Chlamys nobilis* - Kirtisinghe, p. 16, pl. 2, fig. 5.
1981 *Chlamys (Mimachlamys) nobilis* - Eisenberg, pl. 142, fig. 12.
1982 *Chlamys senatoria* - Abbott & Dance, p. 309, fig. in upper mid row, right.
1982 *Chlamys senatorius* - Bosch & Bosch, p. 160, top fig.
1984 *Chlamys senatoria* - Sharabati, pl. 44, fig. 8.
1986 *Chlamys (Mimachlamys) senatoria* - Springsteen & Leobrera, p. 329, pl. 93, fig. 19.
1988 *Pecten senatoria* - Drivas & Jay, p. 136, pl. 53, fig. 1.
1989 *Chlamys senatorius* - Bosch & Bosch, p. 84, bottom fig.
1991 *Chlamys (Mimachlamys) senatoria* - Rombouts, p. 30, pl. 11, figs. 6, 6a.
1991 *Chlamys senatoria* - Abbott, p. 94, pl. 46, fig. 3.
1991 *Mimachlamys senatoria* - Dijkstra, p. 34.
1992 *Chlamys senatoria* - Dharma, p. 84, pl. 20, fig. 3.
1992 *Mimachlamys senatoria* - Lamprell & Whitehead, pl. 10, fig. 56.
1992 *Chlamys senatoria* - Oliver, p. 74, pl. 13, fig. 1.
1995 *Chlamys senatoria* - Bosch, Dance, Moolenbeek & Oliver, p. 230, fig.1003.

The species is distinguished by 1) thin, slightly inequivalve, suborbicular shell attaining 70 mm in height, 2) semicircular ventral side, 3) deep, rounded byssal notch and 4) sculpture of 20-25 even, rounded radial ribs slightly narrower than the intervening spaces, much so on left valve.
DISTRIBUTION AND HABITAT. *Chlamys senatoria* is a subtidal element, locally abundant in the tropical Indo-Pacific, and ranges from East Africa to New Caledonia and Japan. In Thai waters it was reported to occur on dominantly muddy bottoms, at depths of 8-70 m (LYNGE, 1909; TANTANASIRIWONG, 1979).
FOSSIL RECORDS: Oligocene ? of Myanmar; Miocene of Madagascar, East Africa, Iran, India, Myanmar, Indonesia and Philippines; Pliocene of East Africa, Indonesia, Philippines, Taiwan and Japan; Quaternary of Indo-Pacific area; Holocene of Thailand.

Chlamys (Argopecten) pelseneeri (Dautzenberg & Bavay, 1912)
Pl. 6, fig. 2

1909 *Pecten rugosus* - Lynge, p. 154, pl. 3, figs. 1, 2.
1912 *Pecten (Chlamys) pelseneeri* Dautzenberg & Bavay, p. 8.
1978 *Chlamys pelseneeri* - Kirtisinghe, p. 16, pl. 2, fig. 6.
1991 *Argopecten pelseneeri* - Rombouts, p. 7, pl. 6, fig. 3.

The species is distinguished on the basis of 1) subequivalve, slightly higher than long shell attaining 25 mm in length, 2) markedly unequal auricles and 3) sculpture of 19 radial ribs bearing vertical, rather elevated scales.
DISTRIBUTION AND HABITAT. *Chlamys pelseneeri* occurs uncommonly in the Southwest Pacific, from Thailand to Japan. It dwells on sand or gravel in the intertidal and infralittoral zones (BERNARD et al., 1993). In the Gulf of Thailand, the species was recorded from muddy or shell bottoms, at depths of 16-36 m (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Patinopectininae*

Minnivola pyxidata (Born, 1778)
Pl. 6, fig. 3

1909 *Pecten pyxidatus* - Lynge, p. 153.
1935 *Pecten (Pecten) pyxidatus* - Oostingh, p. 150.
1960 *Chlamys pyxidatus* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 75, fig. 62.
1977 *Pecten (Minnivola) pyxidatus* - Habe, p. 90.
1978 *Chlamys pyxidata* - Kirtisinghe, p. 17, pl. 2, fig. 10.
1982 *Pecten pyxidata* - Abbott & Dance, p. 304, fig. in bottom row, right.
1986 *Pecten (Minnivola) pyxidatus* - Springsteen & Leobrera, p. 326, pl. 93, fig. 2.
1991 *Pecten pyxidata* - Abbott, p. 93, pl. 45, fig. 1.
1991 *Pecten (Minnivola) pyxidatus* - Rombouts, p. 53, pl. 20, fig. 2.
1992 *Pecten pyxidata* - Dharma, p. 84, pl. 20, fig. 17.
1992 *Minnivola pyxidata* - Lamprell & Whitehead, pl. 14, fig. 85.
1994 *Minnivola pyxidatus* - Scott, p. 73, pl. 6, fig. B.

Minnivola pyxidata is featured by 1) suborbicular shell attaining 50 mm in length, 2) right valve convex, left valve flat or slightly concave, 3) auricles small, asymmetric, the right anterior with distinct angular byssal notch and ctenolium, 4) right valve sculptured with 27 low radial ribs separated by narrow furrows.
DISTRIBUTION AND HABITAT. The species is distributed from the Red Sea to Australia and northward to South China Sea. It occurs on sand in the 5-100 m bathymetric interval (BERNARD et al., 1993). Previous records in Thai waters were from infralittoral muddy bottoms (LYNGE, 1909; TANTANASIRIWONG, 1979).
FOSSIL RECORDS: Pliocene and Quaternary of Indonesia; Holocene of Thailand.

Family *SPONDYLIDAE*

Spondylus barbatus Reeve, 1856
Pl. 6, figs. 4-6

1847a *Spondylus sinensis* Sowerby, p. 87.
1847b *Spondylus sinensis* - Sowerby, p. 427, pl. 87, figs. 32-34.
1909 *Spondylus sinensis* - Lynge, p. 150.
1951 *Spondylus sinensis* - Habe, p. 84, fig. 165.
1951 *Spondylus barbatus* - Habe, p. 85, figs. 163, 164.
1954 *Spondylus cruentus* - Taky & Oyama, pl. 34, fig. 24; pl. 42, fig. 12.
1965 *Spondylus barbatus cruentus* - Kira, p. 142, pl. 51, fig. 6.
1965 *Spondylus barbatus* - Kira, p. 143, pl. 51, fig. 7.
1971 *Spondylus barbatus* - Kuroda, Habe & Oyama, p. 361, pl. 80, figs. 3, 4.
1977 *Spondylus barbatus* - Habe, p. 93, pl. 14, figs. 1, 2.

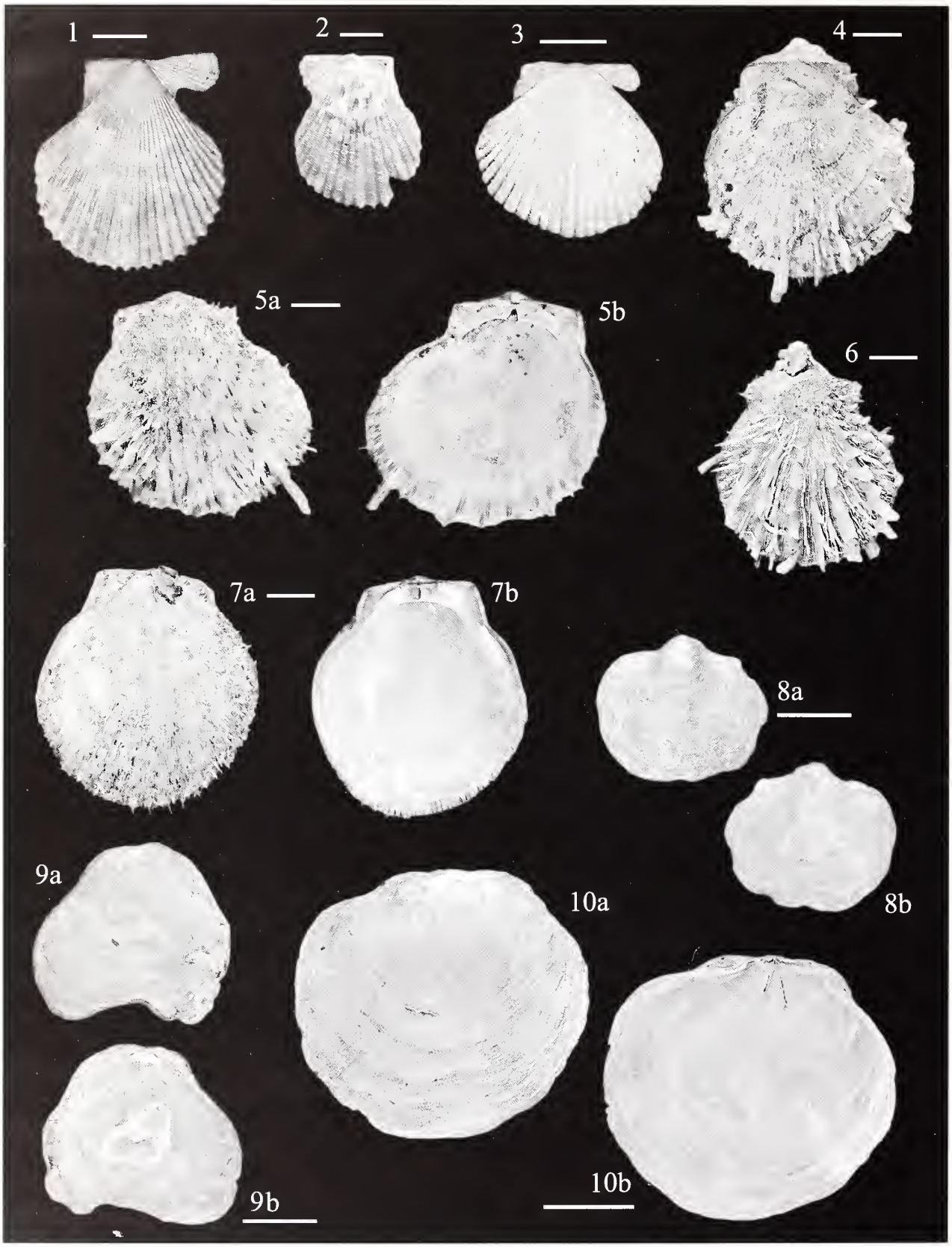

Plate 6: Fig. 1. *Chlamys (Chlamys) senatoria* (Gmelin, 1791), Wat Hoi, Holocene; scale bar 10 mm. Fig. 2. *Chlamys (Argopecten) pelseneeri* (Dautzenberg & Bavay, 1912), Station TH 108; scale bar 2 mm. Fig. 3. *Minnivola pyxidata* (Born, 1778), Locality TH 42B, Holocene; scale bar 10 mm. Figs. 4, 5a, 5b, 6. *Spondylus barbatus* Reeve, 1856, trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Figs. 7a, 7b. *Spondylus nicobaricus* Schreibers, 1793, trash-fish at Ban Laem Phak Bia; scale bar 10 mm. Figs. 8a, 8b. *Anomia acheus* Gray, 1850, Ban Dong Tan, level PK2, Holocene; scale bar 20 mm. Figs. 9a, 9b. *Anomia chinensis* Philippi, 1848, Station TH 30; scale bar 10 mm. Figs. 10a, 10b. *Placuna placenta* (Linnaeus, 1758), trash-fish at Ban Laem Phak Bia; scale bar 30 mm.

1981 *Spondylus sinensis* - Eisenberg, p. 163, pl. 145, fig. 17.
1981 *Spondylus barbatus* - Noda, p. 54, fig. 15.
1986 *Spondylus barbatus* - Springsteen & Leobrera, p. 324, pl. 92, fig. 5.
1987 *Spondylus barbatus* - Lamprell, p. 48, pl. 16, fig. 1.
1992 *Spondylus barbatus* - Dharma, pl. 21, figs. 3, 3a.
1995 *Spondylus barbatus* - Kubo & Kurozumi, p. 166, fig. 6.
1998 *Spondylus barbatus* - Lamprell & Healy, p. 122, fig. 301.

The species is readily recognized on the basis of 1) pectiniform, moderately inequivalve to subequivalve shell attaining 80 mm in height, 2) distinct, nearly symmetric auricles and 3) sculpture of radial riblets on the umbonal area changing into rows of spines in mid-later growth stages; spines in main rows (5-6) are long, imbricate, upturned and more or less spatulate; those in intermediate rows may be either long, slender, sharply pointed and prevalently reclinate or short, well raised and with saw-toothed sides. Thai specimens are light-violet, spotted of reddish-brown over the umbonal area, with mauve spines and orange-brown crenulate inner ventral margin. *Spondylus virgineus* Reeve, 1856 appears to be the most closely related species, differing in that the radial ribs remain visible throughout.

DISTRIBUTION AND HABITAT. *Spondylus barbatus* is a common element in the Southwest Pacific, distributed from Australia to Philippines and Japan. It occurs in the intertidal and infralittoral zones, attached to rocks, corals, shells and shell debris (BERNARD et al., 1993). Previous records in the Gulf of Thailand were from infralittoral shelly and muddy substrates (LYNGE, 1909).

FOSSIL RECORDS: Quaternary of Japan.

Spondylus nicobaricus Schreibers, 1793

Pl. 6, fig. 7

1847b *Spondylus nicobaricus* - Sowerby, p. 428, pl. 88, fig. 48.
1932 *Spondylus hystrix* - Prashad, p. 110.
1939 *Spondylus hystrix* - Adam & Leloup, p. 60, pl. 4, fig. 5.
1960 *Spondylus nicobaricus* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 84, fig. 70.
1960 *Spondylus nicobaricus* - Paes da Franca, p. 91, pl. 22, fig. 3.
1965 *Spondylus nicobaricus* - Kira, p. 142, pl. 51, fig. 2.
1968 *Spondylus (Eleutherospondylus) nicobaricus ciliatus* - Habe, p. 174, pl. 53, fig. 17.
1976a *Spondylus hystrix* - Nielsen, p. 4, fig. 30.
1978 *Spondylus nicobaricus* - Cernohorsky, p. 180, pl. 63, fig. 4.
1978 *Spondylus nicobaricus* - Kirtisinghe, p. 24, pl. 10, fig. 4.
1979 *Spondylus hystrix* - Kay, p. 530, figs. 171 G, 171 H.
1981 *Spondylus hystrix* - Richards, p. 83, pl. 52, fig. 466.
1981 *Spondylus nicobaricus* - Eisenberg, p. 163, pl. 145, fig. 12.
1984 *Spondylus (Spondylus) nicobaricus* - Matsukuma, p. 11, pl. 1, fig. 21.
1984 *Spondylus hystrix* - Sharabati, pl. 45, fig. 10.
1987 *Spondylus nicobaricus* - Lamprell, p. 28, pl. 7, fig. 1.
1990 *Spondylus nicobaricus* - Wells, Bryce, Clark & Hansen, p. 83, pl. 76, fig. 357.
1992 *Spondylus* cf. *hystrix* Oliver, p. 80, pl. 15, fig. 6.
1992 *Spondylus nicobaricus* - Dharma, pl. 21, fig. 4.
1995 *Spondylus hystrix* - Bosch, Dance, Moolenbeek & Dance, p. 233, fig. 1015.
1998 *Spnondylus nicobaricus* - Lamprell & Healy, p. 118, fig. 291.

The specimens in hand are distinguished by 1) ovate, inequivalve, nearly equilateral shell attaining 50 mm in length, 2) small, symmetric wings and 3) sculpture of about 25 narrow, spiny primary radial ribs; the wide intervening spaces bear 3-6 rows of minute spines, those in the intermediate one distinctly stronger. Because of their sculptural features, the Thai shells fit in with the characters of the form *radians* Lamarck, 1819 of *Spondylus nicobaricus*.

DISTRIBUTION AND HABITAT. *Spondylus nicobaricus* is distributed from Madagascar to Australia, Japan, Hawaii. It attaches to dead corals in the intertidal zone and down to 20 m depth (BERNARD et al., 1993). The species was recorded attached to littoral corals in western Thai waters (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Quaternary of Indonesia and Japan.

Superfamily ANOMIOIDEA
Family *ANOMIIDAE*

Anomia acheus Gray, 1850

Pl. 6, fig. 8

1909 *Anomia sol* - Lynge, p. 106, pl. 1, figs. 1, 2.
1932 *Anomia (Anomia) achaeus* - Prashad, p. 29, pl. 1, figs. 54-57.
1935 *Anomia acheus* - Oostingh, p. 156, pl. 14, figs. 131, 132.
1964 *Anomia acheus* - Spry, p. 16, pl. 6, fig. 82.
1978 *Anomia acheus* - Kirtisinghe, p. 22, pl. 8, fig. 2.
1982 *Anomia achaeus* - Bosch & Bosch, p. 163, bottom fig.
1992 *Anomia acheus* - Oliver, p. 85, pl. 17, fig. 7.
1995 *Anomia acheus* - Bosch, Dance, Moolenbeek & Oliver, p. 234, fig. 1017.

Anomia acheus is featured by 1) moderately thin, oval to subcircular, inequivalve shell attaining 50 mm in length, 2) subrounded retractor muscle scars arranged to form a wide obtuse angle and 3) outer surface somewhat iridescent, with commarginal growth markings and fine, undulating radial striation.

DISTRIBUTION AND HABITAT. The species is widely distributed in the tropical Indo-Pacific, from the Gulf of Aden to Indonesia and South China Sea. It occurs intertidally and down to 5 m depth, attached to hard substrates (BERNARD et al., 1993). Previous records in Thai waters were from infralittoral bottoms (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Middle, Late Miocene and Pliocene of Indonesia; Holocene of Thailand.

Anomia chinensis Philippi, 1848

Pl. 6, fig. 9

1850 *Anomia chinensis* - Philippi, p. 131, pl. 1, fig. 1.
1906 *Anomia lischkei* Dautzenberg & Fischer, p. 210, pl. 5, figs. 8-11.
1953b *Anomia chinensis* - Habe, p. 198, pl. 27, fig. 12; pl. 28, fig. 21.
1954 *Anomia lischkei* - Taki & Oyama, pl. 12, fig. 17
1954 *Anomia cyateum* - Taki & Oyama, pl. 12, fig. 18.
1960 *Anomia cyateum* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 92, fig. 77.
1960 *Nomia lischkei* - Makiyama, pl. 100, figs. 4, 5.
1961 *Anomia chinensis* - Hayasaka, p. 33, pl. 3, fig. 7.
1965 *Anomia chinensis* - Kira, p. 132, pl. 47, fig. 8; p. 211, pl. 72, fig. 10.
1971 *Anomia chinensis* - Kuroda, Habe & Oyama, p. 378, pl. 84, figs.12-14.
1977 *Anomia chinensis* - Habe, p. 97, pl. 18, figs. 3, 4.
1983 *Anomia chinensis* - Masuda, Hayasaka & Noda, p. 11, pl. 1, fig. 21.
1986 *Anomia chinensis* - Takayasu, pl. 31, fig. 9.
1986 *Anomia chinensis* - Sato, Masuda & Shuto, p. 26, pl. 3, fig. 3.
1993 *Anomia chinensis* - Noda, Kikuchi & Nikaido, p. 143, figs. 16 (9).
1994 *Anomia chinensis* - Scott, p. 73, pl. 7, fig. A.
1995 *Anomia chinensis* - Noda, Watanabe & Kikuchi, p. 59, fig. 7 (15), 16 (18).

Anomia chinensis is featured by 1) irregularly round, thin, flat shell attaining 40 mm in length, 2) subequal, round retractor muscle scars arranged to form a right angle and 3) outer surface with imbricate growth markings and peripheral low radial folds. *Anomia acheus* Gray, 1850 differs in having convex left valve, retractor scars forming an obtuse angle and fine, undulating radials.

DISTRIBUTION AND HABITAT. The species is distributed in Southea-

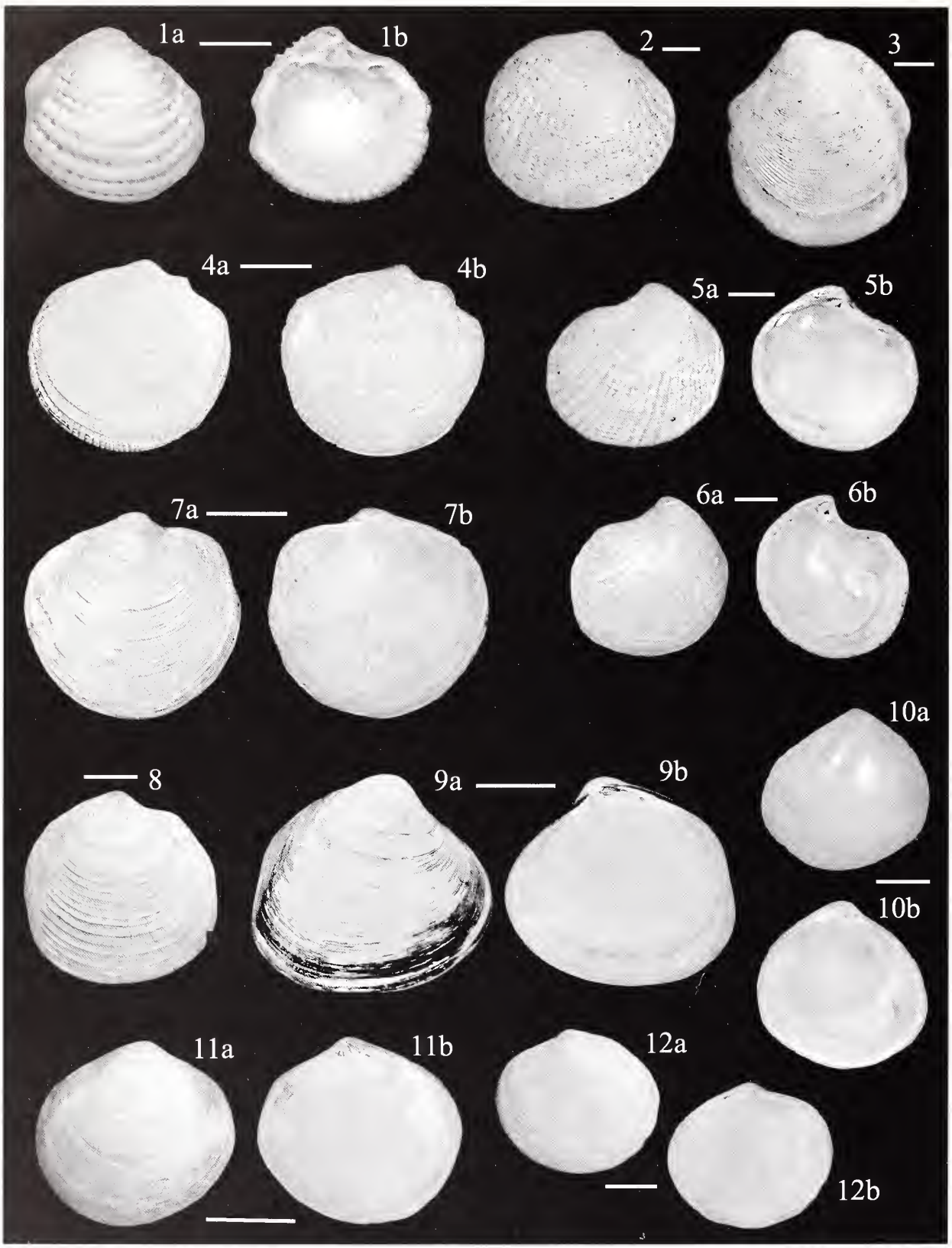

Plate 7: Figs. 1a, 1b. *Parvilucina (Bellucina) semperiana* (Issel, 1869), Station TH 98; scale bar 2 mm. Fig. 2. *Codakia* sp., Locality TH 42B, Holocene, scale bar 1 mm. Fig. 3. *Loripes (Loripes) desideratus* (Smith, 1885), Station TH 108; scale bar 1 mm. Figs. 4a, 4b. *Lucina (Lucinisca) venusta* Philippi, 1847, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 5a, 5b. *Parvilucina (Parvilucina) pulchella* (Lynge, 1909), Station TH 108; scale bar 1 mm. Figs. 6a, 6b. *Pillucina pisidium* (Dunker, 1860), Station TH 76; scale bar 0.5 mm. Figs. 7a, 7b. *Anodontia (Anodontia) edentula* (Linnaeus, 1758), Station TH 7; scale bar 10 mm. Fig. 8. *Eamesiella corrugata* (Deshayes, 1843), Senanivate, Quarry 2, level SEN 3, Holocene; scale bar 5 mm. Figs. 9a, 9b. *Cycladicama oblonga* (Hanley, 1844), Station TH 15; scale bar 10 mm. Figs. 10a, 10b. *Felaniella (Zemysia) conspicua* (Smith, 1885), Station TH 12; scale bar 2 mm. Figs. 11a, 11b. *Phlyctiderma amboinense* (Smith, 1885), Station TH 108; scale bar 5 mm. Figs. 12a, 12b. *Phlyctiderma japonicum* (Pilsbry, 1895), Station TH 108; scale bar 2 mm.

st Asian waters and northward to Japan. It attaches to hard substrates in the intertidal zone and down to 20 m (BERNARD et al., 1993).
FOSSIL RECORDS: Pliocene and Quaternary of Taiwan and Japan.

Family *PLACUNIDAE*

Placuna placenta (Linnaeus, 1758)
Pl. 6, fig. 10

1852 *Placuna placenta* - Sowerby, p. 321, fig. 184.
1909 *Placuna placenta* - Lynge, p. 107.
1922 *Placuna placenta* - Dickerson, pl. 7, fig. 2.
1953b *Placuna placenta* - Habe, p. 195, pl. 28, figs. 17, 18.
1956 *Placenta placenta* - Satyamurti, p. 65, pl. 10, fig. 3.
1960 *Placuna placenta* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 90, fig. 75.
1960 *Placuna placenta* - Makiyama, pls. 97, 98.
1965 *Placuna (Placuna) placenta* - Kira, p. 133, pl. 47, fig. 13.
1969 *Placuna (Placuna) placenta* - Treatise I. P., p. N385, fig. C103 (5).
1976 *Placuna placenta* - Lindner, p. 224, pl. 57, fig. 1.
1977 *Placuna (Placuna) placenta* - Habe, p. 99, pl. 18, figs. 1, 2.
1978 *Placuna placenta* - Kirtisinghe, p. 22, pl. 8, fig. 1.
1980 *Placuna placenta* - Young, p. 141-147, figs. 1-4.
1982 *Placuna placenta* - Abbott & Dance, p. 317, fig. in bottom row, right.
1984 *Placuna (Placuna) placenta* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 417, pl. 2, fig. 14.
1986 *Placuna placenta* - Springsteen & Leobrera, p. 317, pl. 90, fig. 3.
1992 *Placuna placenta* - Dharma, p. 86, pl. 21, fig. 12.
1992 *Placuna placenta* - Oliver, p. 86, pl. 17, fig. 6.
1992 *Placuna (Placuna) placenta* - Lamprell & Whitehead, pl. 15, fig. 87.
1995 *Placuna placenta* - Bosch, Dance, Moolenbeek & Oliver, p. 234, fig. 1018.

This is a well known species readily recognized on account of 1) thin, fragile, flat orbicular shell up to 150 mm in length, 2) long, widely diverging crura and 3) outer surface with exceedingly fine radial striation.
DISTRIBUTION AND HABITAT. *Placuna placenta* is a shallow water element widely distributed in the tropical Indo-Pacific, from the Red Sea to Australia and northward to China and Japan. According to BERNARD et al. (1993), the species occurs intertidally and down to 20 m depth, on sand and mud. In western Thailand it was noted on mud flats between tide marks and down to a depth of 20 m (TANTANASIRIWONG, 1979). In the Gulf of Thailand the species was recorded mainly from muddy bottoms at depths of 5-35 m (LYNGE, 1909). Along the Malayan and Singapore coasts, *Placuna placenta* was recovered from intertidal sands covered with a thin film of mud, lying on the surface of the sand, and from mangrove areas (PURCHON & PURCHON, 1981; MORRIS & PURCHON, 1981). LI FU-XIE & GAO SHI-HE (1985) found the species in the mangrove swamps of Hong Kong.
FOSSIL RECORDS: Late Miocene of Indonesia and Philippines; Pliocene of Indonesia, Philippines, Taiwan and Japan; Quaternary of Indonesia; Holocene of Thailand.

Subclass HETERODONTA
Superfamily LUCINOIDEA
Family *LUCINIDAE*
Subfamily *Lucininae*

Codakia sp.
Pl. 7, fig. 2

The present unidentified species is represented by fully grown specimens attaining 8 mm in length. The distinguishing characters are 1) subcircular, rather inflated, triflingly inequilateral shell, 2) small, prosogyrate beaks, 3) lunule cordate, very small and concave, 4) inner margin smooth, 5) anterior adductor scar elongate, divergent and 6) sculpture of strong, flat commarginal cords cut into crescent-shaped segments by fine radial grooves which are more distant over shell extremities. The Thai specimens appear to be unlike any *Codakia* species. They were obtained from clayey deposits quarried north of Cha Am.
FOSSIL RECORDS: Holocene of Thailand.

Loripes (Loripes) desideratus (Smith, 1885)
Pl. 7, fig. 3

1885 *Lucina (Loripes) desiderata* Smith, p. 185, pl. 13, figs. 10, 10a.
1909 *Lucina (Loripes) desiderata* - Lynge, p. 171.

This small lucinid is characterized by 1) moderately convex small shell up to 8 mm, subquadrangular with nearly straight and subvertical posterior margin, distinctly higher than long in fully grown specimens, 2) shallow posterior radial depression, 3) internal ligament and 4) sculpture of low, rather dense and evenly spaced lamellae which are somewhat more raised anteriorly and posteriorly.
DISTRIBUTION AND HABITAT. The species is so far known from New Guinea and the Gulf of Thailand. Records were from muddy bottoms 18-50 m deep (SMITH, 1885; LYNGE, 1909).
FOSSIL RECORDS: none recorded.

Lucina (Lucinisca) venusta Philippi, 1847
Pl. 7, fig. 4

1847 *Lucina venusta* Philippi, p. 206, pl. 1, fig. 2.
1909 *Lucina (Codakia) venusta* - Lynge, p. 169.
1914 *Myrtea venusta* - Hedley, p. 266, pl. 16, fig. 10.
1920 *Phacoides (Lucinisca) venustus* - Lamy, p. 186.

Lucina venusta is featured by 1) orbicular, nearly equilateral shell attaining 30 mm in length, 2) small, pointed, prosogyrate beaks, 3) antero-dorsal and postero-dorsal margins rather short and straight, forming an angle of about 120°, 4) ventral margin broadly and regularly arched, 5) lunule leaf-shaped, depressed but with raised inner part, 6) inner margin dentate and 7) sculpture of numerous, low radial riblets crossed by even commarginal shallow grooves forming a reticulate pattern.
DISTRIBUTION AND HABITAT. The species occurs uncommonly in the Southwest Pacific: records are from the Gulf of Thailand, Philippines and Australia. There is no information about its ecological requirements.
FOSSIL RECORDS: Holocene of Thailand.

Parvilucina (Bellucina) semperiana (Issel, 1869)
Pl. 7, fig. 1

1861 *Lucina (Myrtea) seminula* Gould, p. 36.
1869 *Lucina semperiana* Issel, p. 82.
Not 1885 *Lucina (Codakia) seminula* - Smith, p. 180, pl. 13, fig. 5, 5a (= *Phacoides rugosus* Hedley, 1909).
1885 *Lucina (Codakia) pisum* - Smith, p. 181.
1909 *Lucina (Phacoides) pisum* - Lynge, p. 172.
1916 *Phacoides (Bellucina) semperianus* - Lamy, p. 154.
1920 *Phacoides (Bellucina) semperianus* - Lamy, p. 211.
1964 *Lucina (Myrtea) seminula* - Johnson, p. 148, pl. 28, fig. 3.
1969 *Linga (Bellucina) semperiana* - Treatise I. P., p. 496, fig. E3, 2, 4.
1972 *Parvilucina (Bellucina) semperiana* - Britton, p. 9, fig. 4a.

1982 *Lucina semperiana* - Bouchet & Danrigal, p. 16, fig. 19.
1992 *Bellucina semperiana* - Oliver, p. 99, pl. 19, fig. 7.
1995 *Bellucina semperiana* - Bosch, Dance, Moolenbeek & Oliver, p. 235, fig. 1020.

This small lucinid is readily recognized on the basis of 1) globose, subquadrangular in outline, robust shell not exceeding 8 mm in length, 2) anterior side slightly longer than the posterior one, 3) lunule small, heart-shaped, deeply excavated, 4) inner margins strongly dentate, 5) sculpture of thick, raised commarginal lamellae, more crowded toward the ventral margin and dense, rounded radial ribs in the intervening spaces. The sculpture is the most distinctive feature. *Lucina seminula* Gould, 1861 (not *seminulum* Deshayes, 1858) is currently regarded as a synonym of *Lucina semperiana*.

DISTRIBUTION AND HABITAT. *Parvilucina semperiana* is a widely distributed infralittoral element ranging in the tropical Indo-Pacific, from East Africa to Australia and the Philippines. In the Gulf of Thailand it was found in different substrates from the low tide mark to about 36 m depth (LYNGE, 1909, sub *Lucina pisum*).

FOSSIL RECORDS: Holocene of Thailand.

Parvilucina (Parvilucina) pulchella (Lynge, 1909)

Pl. 7, fig. 5

1909 *Lucina (Phacoides) pulchella* Lynge, p. 173, pl. 3, figs. 13-15.

Parvilucina pulchella is featured by 1) convex, irregularly rounded, small shell not exceeding 4 mm in length, 2) weak posterior radial depression, 3) 11 strong, often bifurcating primary ribs, 4) weak and well spaced commarginal lamellae overriding the ribs and 5) anterior and posterior areas devoid of ribs. There seems to be no related species in the West Pacific. The species is herein assigned to the genus *Parvilucina* Dall, 1901 with some reservation. Actually, it exhibits a reasonnably good resemblance to *Parvilucina costata* (d'Orbigny, 1842) as figured by BRITTON (1972).

DISTRIBUTION AND HABITAT. *Parvilucina pulchella* is so far known from the Gulf of Thailand. Previous records were from a variety of soft and hard substrates in the 2-54 m bathymetric interval (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Pillucina pisidium (Dunker, 1860)

Pl. 7, fig. 6

1954 *Pillucina pisidium* - Taki & Oyama, pl. 11, fig. 6.
1964 *Lucina (Codakia) parvula* - Johnson, p. 122, pl. 28, fig. 5.
1968 *Pillucina pisidium* - Habe, p. 182, pl. 56, fig. 20.
1971 *Pillucina (Pillucina) pisidium* - Kuroda, Habe & Oyama, p. 393, pl. 118, fig. 14.
1977 *Pillucina (Pillucina) pisidium* - Habe, p. 126, pl. 24, figs. 5, 6.
1979 *Pillucina pisidium* - Tantanasiriwong, p. 8.
1980 *Pillucina pisidium* - Volova & Scarlato, p. 49, fig. 42.
1986 *Pillucina pisidium* - Takayasu, pl. 72, figs. 4, 5.
1993 *Pillucina pisidium* - Janssen, p. 418, pl. 7, fig. 61.
1995 *Pillucina pisidium* - Kubo & Kurozumi, p. 174, fig. 4.

Pillucina pisidium is recognized on the basis of 1) roundly subquadrangular, moderately inflated shell attaining 5 mm in length, 2) anterior side slightly longer than the posterior one, 3) lunule short, broadly oval, well excavated, 4) dentate inner margin and 5) sculpture of low, broad radial ribs which tend to diverge anteriorly and posteriorly, obsolescent in the middle part; the ribs are crossed by rather evenly spaced commarginal lamellae, more raised posteriorly.

DISTRIBUTION AND HABITAT. The species seems to be distributed from Southeast Asian waters nortward to China Sea and Japan. It occurs in sand and mud, from the intertidal zone to 40 m depth (BERNARD et al., 1993).

FOSSIL RECORDS: Pliocene and Quaternary of Japan; Holocene of Thailand.

Subfamily *Milthinae*

Anodontia (Anodontia) edentula (Linnaeus, 1758)

Pl. 7, fig. 7

1847 *Lucina edentula* - Philippi, p. 205, pl. 1, fig. 1.
1909 *Lucina (Thyasira) edentula* - Lynge, p. 71.
1916 *Lucina edentula* - Lamy, pp. 145, 147.
1920 *Lucina edentula* - Lamy, pp. 78, 80.
1932 *Lucina edentula* - Prashad, p. 154.
1956 *Lucina edentula* - Satyamurti, p. 75, pl. 12, fig. 1.
1960 *Lucina edentula* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 119, fig. 99.
1965 *Anodontia edentula* - Kira, p. 150, pl. 54, fig. 6.
1969 *Anodontia (Anodontia) edentula* - Treatise I. P., p. N502, fig. E9 (6).
1976a *Anodontia* cf. *edentula* Nielsen, p. 5, fig. 47.
1977 *Anodontia edentula* - Habe, p. 128, pl. 23, figs. 11, 12.
1978 *Anodontia edentula* - Kirtisinghe, p. 27, pl. 12, fig. 5.
1979 *Anodontia edentula* - Tantanasiriwong, p. 8.
1979 *Lucina edentula* - Kay, p. 543, fig. 177.
1979 *Anodontia edentula* - Di Geronimo & Robba, pl. 1, fig. 5.
1982 *Anodontia edentula* - Abbott & Dance, p. 321, fig. in bottom row, right.
1984 *Anodontia edentula* - Sharabati, pl. 45, figs. 7, 7a.
1984 *Anodontia edentula* - Matsukuma, p. 15, pl. 3, fig. 5.
1988 *Anodontia edentula* - Drivas & Jay, p. 138, pl. 54, fig. 8.
1991 *Anodontia edentula* - Abbott, p. 95, pl. 48, fig. 8.
1992 *Anodontia edentula* - Oliver, p. 100, pl. 20, fig. 8.
1992 *Anodontia (Anodontia) edentula* - Lamprell & Whitehead, pl. 22, fig. 138.
1994 *Anodontia edentula* - Coulombel, p. 125, fig. in top and bottom rows, right.
1995 *Anodontia edentula* - Bosch, Dance, Moolenbeek & Oliver, p. 236, fig. 1028.
1995 *Anodontia edentula* - Scott, p. 41, fig. in same page.
1995 *Anodontia edentula* - Kubo & Kurozumi, p. 172, top fig.; p. 173, fig. 5.

Anodontia edentula is readily distinguished on account of 1) rather globose, subcircular, slightly inequilateral shell attaining 75 mm in length, 2) antero-dorsal and postero-dorsal margins forming a nearly straight angle, 3) posterior side more broadly rounded than the anterior, 4) lunule small, ill defined, 5) hinge edentulous, 6) oblique ligamental groove, 7) strongly divergent anterior adductor scar and 8) surface with uneven, fine growth markings and faint radial lines. *Anodontia stearnsiana* (Oyama, 1954) is closely related, but differs in having distinct antero-dorsal and postero-dorsal angles.

DISTRIBUTION AND HABITAT. The species is widely distributed in the tropical Indo-Pacific, from the Red Sea to Hawaii and from Queensland to Okinawa. It occurs commonly in muddy and sandy bottoms in the intertidal zone and down to 50 m (KIRA, 1965; ABBOTT & DANCE, 1982; BERNARD et al., 1993). *Anodontia edentula* was recovered in the Gulf of Thailand at depths of from 54 to 70 m (LYNGE, 1909; Scott, 1995). In western Thai waters it was reported to occur on mud flats seaward of mangrove forest (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Holocene of Thailand.

Eamesiella corrugata (Deshayes, 1843)

Pl. 7, fig. 8

1969 *Eamesiella corrugata* - Treatise I. P., p. 502, fig. E8, 3.
1982 *Eamesiella corrugata* - Abbott & Dance, p. 320, fig. in lower mid row, right.
1992 *Austriella corrugata* - Lamprell & Whitehead, pl. 23, fig. 145.

The species is featured by 1) moderateley inflated, subquadrangular shell attaining 55 mm in length, 2) subtruncate posterior end, 3) inconspicuous lunule, 4) edentulous hinge and 5) sculpture of distant, wave-like commarginal ridges. The shell shape may vary from rectangular to almost squared.

DISTRIBUTION AND HABITAT. *Eamesiella corrugata* is distributed from northern Australia to Indonesia and Japan. It is locally common in sandy and muddy substrates, intertidally to 15 m depth (BERNARD et al., 1993). The species occurs on mud flats seaward of mangrove forests (TANTANASIRIWONG, 1979) or within the mangal (LAMPRELL & WHITEHEAD, 1992).

FOSSIL RECORDS: Holocene of Thailand.

Family *UNGULINIDAE*

Cycladicama oblonga (Hanley, 1844)

Pl. 7, fig. 9

1883 *Cytherea (Callista) everwijni* Martin, p. 252, pl. 13, figs. 49, 49b.
1909 *Diplodonta (Joannisiella) oblonga* - Lynge, p. 176.
1920 *Joannisiella oblonga* - Lamy, p. 382.
1968 *Cycladicama oblonga* - Habe, p. 181, pl. 56, fig. 9.
1969 *Cycladicama (Cycladicama) oblonga* - Treatise l. P., p. 515, fig. E20, 11.
1978 *Cycladicama oblonga* - Popenoe & Kleinpell, pl. 14, figs. 174-176.
1984 *Cycladicama oblonga* - Dheeradilok, Chaimanee, Piccoli & Robba, pl. 2, figs. 6, 7.
1988 *Cycladicama oblonga* - Tsuchida, pl. 1, fig. 3.

Distinctive features are 1) transversely ovate-triangular, moderately inflated, inequilateral shell up to 50 mm in length, 2) obliquely truncate posterior end, 3) blunt but distinct posterior ridge, 4) gently arched ventral margin, 5) deep ligament groove confluent with resilial socket, 6) hinge with 2 diverging cardinals in each valve, 7) surface with uneven growth markings. The more elongate, ovate-triangular shell distinguishes *Cycladicama oblonga* from the other *Cycladicama* species.

DISTRIBUTION AND HABITAT. The species ranges from the Gulf of Thailand to Japan. It is reported to occur commonly on fine sandy bottoms at depths of 10-50 m (HABE, 1968). In the Gulf of Thailand, *Cycladicama oblonga* was recovered from muddy bottoms 9-36 m deep (LYNGE, 1909).

FOSSIL RECORDS: Middle Miocene to Quaternary of Indonesia, Philippines, Taiwan and Japan; Holocene of Thailand.

Felaniella (Zemysia) conspicua (Smith, 1885)

Pl. 7, fig. 10

1885 *Diplodonta conspicua* Smith, p. 198, pl. 14, fig. 11.
1909 *Diplodonta conspicua* - Lynge, p. 175.
1920 *Dilodonta conspicua* - Lamy, p. 355.
1998 *Felaniella (Zemysia) conspicua* - Lamprell & Healy, p. 150, fig. 379 (*holotype*).

This distinctive species attains 11 mm in length. It is readily recognized in that exhibits 8-9 denticles on the inner anterior margin, 4-5 on the inner posterior one.

DISTRIBUTION AND HABITAT. *Felaniella conspicua* ranges from Australia to the Gulf of Thailand. Records from these areas refer to muddy or mixed infralittoral substrates (LYNGE, 1909; LAMPRELL & HEALY, 1998).

FOSSIL RECORDS: Holocene of Thailand.

Phlyctiderma amboinense (Smith, 1885)

Pl. 7, fig. 11

1885 *Diplodonta amboinensis* Smith, p. 199, pl. 14, figs. 12, 12a.
1909 *Diplodonta amboinensis* - Lynge, p. 174.

This uncommon species is featured by 1) suborbicular, moderately convex, distinctly inequilateral shell attaining 20 mm in length, 2) posterior side higher and more broadly rounded than the anterior one, 3) slightly prosogyrate beaks, 4) lunule indistinct, 5) hinge with 2 divergent cardinals in each valve, 6) adductor scars confluent with pallial line, 7) surface with uneven growth markings more raised anteriorly; a minute subpunctation is noted, particularly over the posterior part. This latter character points toward the assignment to the genus *Phlyctiderma* Dall, 1899.

DISTRIBUTION AND HABITAT. The original material was recovered at Amboina, Molucca Islands, at depths of 27-36 m. Previous records in the Gulf of Thailand were from sandy and muddy substrates 2-27 m deep (LYNGE, 1909).

FOSSIL RECORDS: Holocene of Thailand.

Phlyctiderma japonicum (Pilsbry, 1895)

Pl. 7, fig. 12

1920 *Diplodonta (Phlyctiderma) japonica* - Lamy, p. 371.
1954 *Diplodonta (Phlyctiderma) japonica* - Taki & Oyama, pl. 11, fig. 4.
1965 *Phlyctiderma japonicum* - Kira, p. 148, pl. 53, fig. 30.
1977 *Phlyctiderma japonicum* - Habe, p. 136, pl. 24, figs. 11, 12.

Phlyctiderma japonicum is featured by 1) roundly subquadrangular, inflated shell attaining 20 mm in length, 2) antero-dorsal and postero-dorsal margins triflingly arched, forming a nearly straight angle and 3) external surface punctate. There seems to be no related species in the Indo-Southwest Pacific.

DISTRIBUTION AND HABITAT. *Phlyctiderma japonicum* was hitherto known from Japanese and Korean waters. It is a coral and limestone borer occurring between tide marks (KIRA, 1965) and down to 20 m depth (HABE, 1977).

FOSSIL RECORDS: none recorded.

Superfamily GALEOMMATOIDEA
Family *GALEOMMATIDAE*

Leiochasmea sp.

Pl. 8, fig. 1

Two valves are in hand, the largest 5.5 mm long. Diagnostic features are 1) elliptical, convex, slightly inequilateral thin shell, 2) gaping postero-ventral margin, 3) hinge edentulous, 4) shallow and narrow, oblique resilial furrow cutting the dorsal margin just under the beak and 5) outer surface with coarse growth markings. The assignment to the genus *Leiochasmea* Dall, Bartsch & Rehder, 1938 is based primarily on edentulous hinge and ligament features. *Leiochasmea elongata* Preston, 1908 is similar but has somewhat longer shell and smaller, less protruding beaks.

Family *KELLIIDAE*
Subfamily *Kelliinae*

Kellia laperousii Deshayes, 1839

Pl. 8, fig. 2

1958 *Kellia laperousii* - Makiyama, pl. 56, fig. 8.
1977 *Kellia laperousii* - Habe, p. 141.

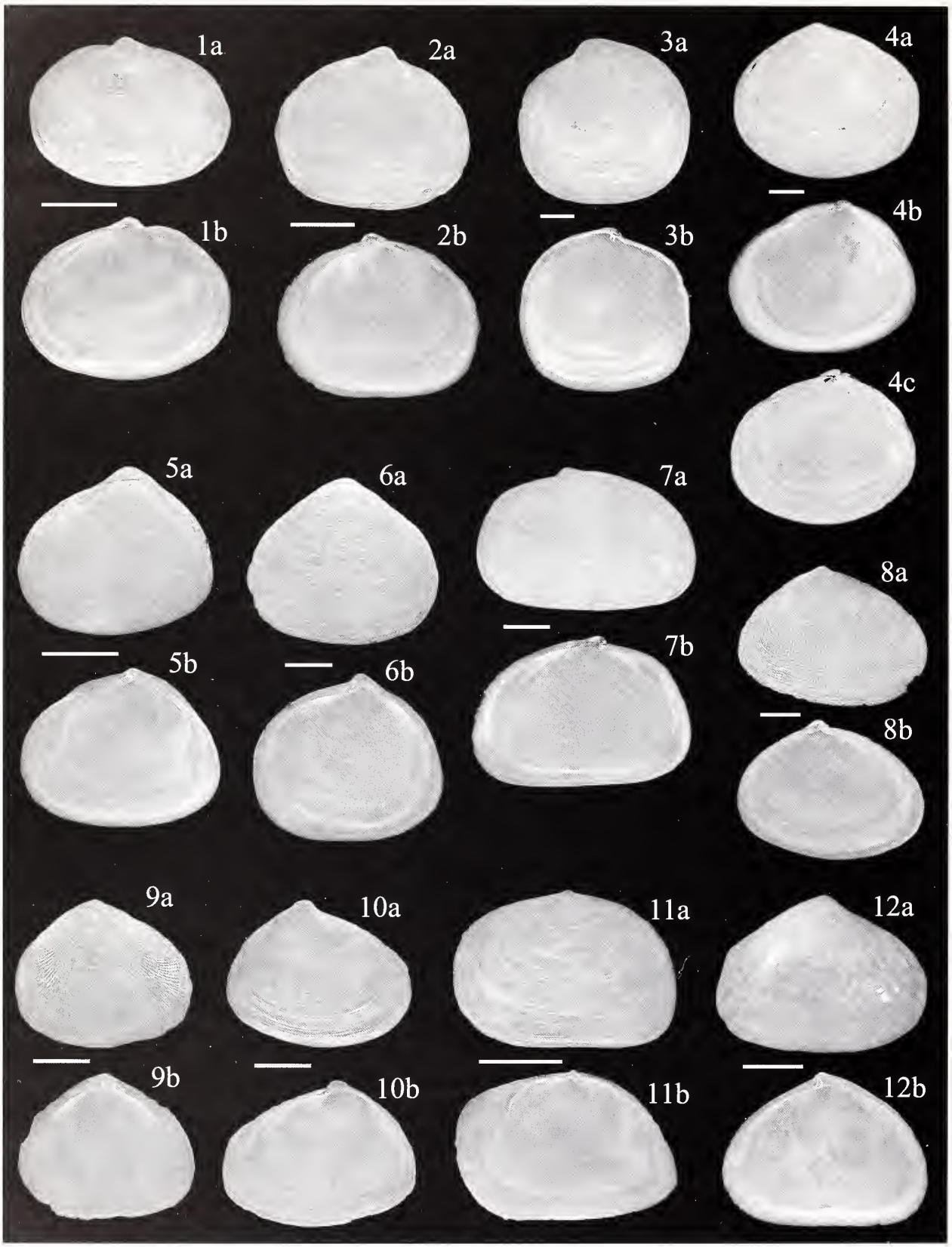

Plate 8: Figs. 1a, 1b. *Letochasmea* sp., Station TH 81, scale bar 1 mm. Figs. 2a, 2b. *Kellia laperousii* Deshayes, 1839, Station TH 23, scale bar 1 mm. Figs. 3a, 3b. *Kellia porculus* Pilsbry, 1904, Station TH 106, scale bar 2 mm. Figs. 4a, 4b, 4c. *Kellia* sp. 1, Station TH 71; scale bar 1 mm. Figs. 5a, 5b. *Kellia* sp. 2, Station TH 40; scale bar 1 mm. Figs. 6a, 6b. *Kellia* sp. 3, Station TH 25; scale bar 2 mm. Figs. 7a, 7b. *Marikellia elongata* (Lynge, 1909), Station TH 108; scale bar 2 mm. Figs. 8a, 8b. *Pseudopythina ariakensis* (Habe, 1959), Station TH 108; scale bar 2 mm. Figs. 9a, 9b. *Pseudopythina venusta* (Lynge, 1909), Station TH 108; scale bar 1 mm. Figs. 10a, 10b. *Pseudopythina* sp., Locality TH 33, level F, Holocene; scale bar 1 mm. Figs. 11a, 11b. *Scintillula* sp., Station TH 73; scale bar 5 mm. Figs. 12a, 12b. *Melliteryx puncticulata* (Yokoyama, 1924), Ban Tak Daet, sample BTD1, Holocene; scale bar 1 mm.

A single right valve 3.8 mm long is in hand. Main features are 1) oval, subequilateral outline, 2) relatively large, protruding beak, 3) ventral margin gently arched, 4) hinge with 2 distinct cardinals just anterior to the beak, one small and tuberculiform nearly at the margin, the other stronger, hooked and connected to a low ridge parallel to the margin, 1 distant weak posterior lateral, 5) slightly oblique, narrow and very shallow ligament groove and 6) outer surface shining, with very fine growth lines.

DISTRIBUTION AND HABITAT. The species was based on Japanese fossil material. Except for a record from 70 m depth quoted by HABE (1977), there is no information about its ecological requirements.

FOSSIL RECORDS: Pleistocene of Japan.

Kellia porculus Pilsbry, 1904

Pl. 8, fig. 3

1904 *Kellia porculus* Pilsbry, p. 558, pl. 41, figs. 18-20.
1968 *Kellia porculus* - Habe, p. 184, pl. 57, fig. 6.
1971 *Kellia porculus* - Kuroda, Habe & Oyama, p. 405, pl. 119, figs. 3, 4.
1977 *Kellia porculus* - Habe, p. 139, pl. 26, figs. 10-12.
1986 *Kellia porculus* - Takayasu, pl. 66, fig. 1.
1990 *Kellia porculus* - Ito, p. 120, pl. 29, fig. 6.
1994 *Kellia porculus* - Scott, p. 76, pl. 7, fig. D.

Kellia porculus is featured by 1) suborbicular, tumid, slightly inequilateral shell attaining 10 mm in length, 2) stout, elevated beaks, 3) anterior side short, somewhat attenuated, 4) hinge of the left valve with 2 cardinals and 1 small but distinct posterior lateral, 5) rather wide, oblique and backward directed resilial groove, 6) adductor scars just above midline and 7) outer surface with uneven growth markings.

DISTRIBUTION AND HABITAT. The species was so far reported to range from South China Sea to Japan. It attaches by byssus to empty shells, gravel, coral heads and rocks intertidally and down to 20 m depth (HABE, 1968; KURODA et al., 1971; BERNARD et al., 1993).

FOSSIL RECORDS: Quaternary of Japan.

Kellia sp. 1

Pl. 8, fig. 4

The present species is characterized by 1) suborbicular, convex, slightly inequilateral shell attaining 6 mm in length, 2) anterior side slightly attenuated, 3) hinge with 1 distinct, somewhat curved cardinal and distant anterior and posterior laterals in the right valve, 2 cardinals and 1 posterior lateral in the left valve, 4) narrow, oblique and backward directed resilial groove, 5) adductor scars just above midline and 6) outer surface with fine, even growth lines. *Kellia porculus* Pilsbry, 1904 differs in having stouter and more protruding beaks and more attenuated anterior side. *Kellia rosea* Lynge, 1909 has a more regular, almost circular outline.

FOSSIL RECORDS: Holocene of Thailand.

Kellia sp. 2

Pl. 8, fig. 5

This unidentified species exhibits 1) ovate-triangular, inequilateral, small shell not exceeding 3 mm in length, 2) anterior part oval, posterior part shorter and quickly attenuated, 3) hinge with 1 rather strong, curved cardinal continuing anteriorly in a low ridge parallel to the dorsal margin and 1 posterior lateral in the right valve, 2 small cardinals and 1 posterior lateral in the left valve, 4) superficial, narrow, oblique and backward directed resilial furrow and 5) outer surface with fine commarginal growth lines, exceedingly faint radial striation and a few pink to reddish-brown radial rays. The outline along with the features of the right cardinal appear to be the most distinguishing characters. *Kellia japonica* Pilsbry, 1895 exhibits a more regularly rounded outline.

FOSSIL RECORDS: Holocene of Thailand.

Kellia sp. 3

Pl. 8, fig. 6

The present species is characterized by 1) ovate or ovate-triangular, convex, subequilateral shell attaining 6 mm in length, 2) hinge with 2 distinct cardinals just anterior to the beak, one at the margin, the other stronger and somewhat curved below it in the right valve, 1 projecting spiny cardinal in the left valve, obsolete laterals, 3) shallow, oblique and backward directed resilial groove, 4) outer surface rough because of uneven, irregularly granulose commarginal thin cords and 5) inner surface with faint radial striation. The shape appears to be rather variable.

FOSSIL RECORDS: Holocene of Thailand.

Marikellia elongata (Lynge, 1909)

Pl. 8, fig. 7

1909 *Kellya elongata* Lynge, p. 179, pl. 3, figs. 23, 24.

Marikellia elongata is featured by 1) transversely subquadrangular, rather convex, small shell not exceeding 8 mm in length, 2) posterior side slightly higher than anterior, 3) ventral margin straight or triflingly concave, 3) hinge with 2 small cardinals and 1 posterior lateral in each valve, 4) oblique, deep resilifer behind cardinals and 5) external surface with growth lines and very faint radial striation. *Marikellia pustula* (Deshayes, 1863) has slightly higher and more inequilateral shell.

DISTRIBUTION AND HABITAT. *Marikellia elongata* is so far known from the Gulf of Thailand. The single valve on which the species is based was obtained from a bottom of sandy mud 18 m deep (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Pseudopythina ariakensis (Habe, 1959)

Pl. 8, fig. 8

1968 *Borniopsis ariakensis* - Habe, p. 184, pl. 57, fig. 9.
Not 1991 *Borniopsis ariakensis* - Lan Xiu, p. 332, pl. 7, figs. 1-3, 8, 9.

Pseudopythina ariakensis exhibits 1) elongate-oval shell attaining 11 mm in length, 2) oval, elongate anterior side, 3) short, attenuated posterior part, 4) hinge with 1 distinct cardinal and 1 obsolescent posterior lateral in each valve, 5) oblique, drop-like resilifer and 6) outer surface sculptured with fine, closely set radial riblets which diverge and bifurcate toward the anterior and posterior ends. *Pseudopythina venusta* (Lynge, 1909), with which the present species co-occurs, is identically sculptured but has shorter shell, 2 left cardinals and more distinct posterior laterals.

DISTRIBUTION AND HABITAT. *Pseudopythina ariakensis* was hitherto known from Japanese and Hong Kong waters. According to HABE (1968), it occurs on muddy bottoms in the 10-30 m bathymetric interval.

FOSSIL RECORDS: none recorded.

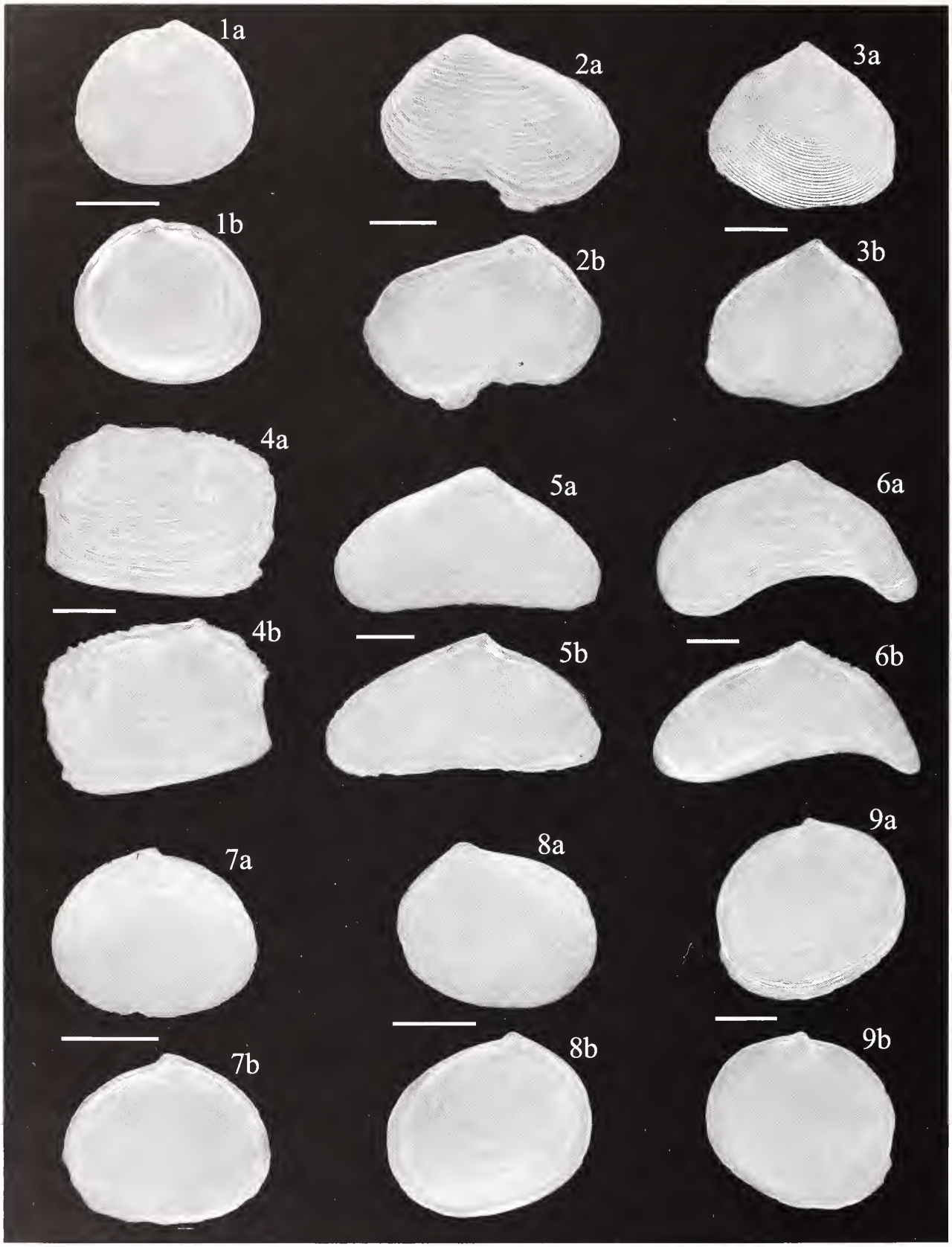

Plate 9: Figs. 1a, 1b. *Parvikellia* sp., Station TH 103; scale bar 1 mm. Figs. 2a, 2b. *"Erycina" lineata* (Lynge, 1909), Station TH 104; scale bar 0.5 mm. Figs. 3a, 3b. *Erycininae* sp., Locality TH 42B, Holocene; scale bar 0.5 mm. Figs. 4a, 4b. *Callomysta matsui* Habe, 1951, Station TH 23; scale bar 1 mm. Figs. 5a, 5b. *Curvemysella arcuata* (Adams, 1856), Ban Tak Daet, sample BTD1, Holocene; scale bar 1 mm. Figs. 6a, 6b. *Curvemysella paula* (Adams, 1856), Station TH 79; scale bar 1 mm. Figs. 7a, 7b. *Fronsella* sp., Station TH 103; scale bar 1 mm. Figs. 8a, 8b. *Tellimya* sp. 1, Locality TH 33, level E, Holocene; scale bar 1 mm. Figs. 9a, 9b. *Tellimya* sp. 2, Locality TH 33, level D, Holocene; scale bar 0.5 mm.

Pseudopythina venusta (LYNGE, 1909)
Pl. 8, fig. 9
1909 *Montacuta venusta* Lynge, p. 181, pl. 3, figs. 28, 29.

Pseudopythina venusta has 1) ovate-trigonal, slightly convex, small shell not exceeding 9 mm in length, 2) attenuated and elongate anterior side, 3) hinge with 1 right, 2 left small cardinals and 1 short posterior lateral in each valve, 4) triangular ligament pit just behind the cardinals and 5) outer surface sculptured with fine, closely set radial riblets which diverge and bifurcate toward the anterior and posterior ends. *Pseudopythina tsurumaru* (Habe, 1959) is the most closely related species differing in that has more inequilateral valves.
DISTRIBUTION AND HABITAT. *Pseudopythina venusta* is so far known from the Gulf of Thailand. The single record was from a muddy bottom 18 m deep (LYNGE, 1909).
FOSSIL RECORDS: none recorded.

Pseudopythina sp.
Pl. 8, fig. 10
The present *Pseudopythina* species is represented by two 4 mm long left valves. It is similar to *Pseudopythina venusta* (Lynge, 1909) as regards shell shape, hinge and ligament characters, but differs in that is more convex, lacks the peculiar radial sculpture of the outer surface and has a subobsolete posterior lateral tooth.
FOSSIL RECORDS: Holocene of Thailand.

Scintillula sp.
Pl. 8, fig. 11
The present unidentified species is featured by 1) ovate-subquadrangular, somewhat inflated, slightly inequilateral, thin shell attaining 15 mm in length, 2) posterior part attenuated, 3) ventral margin nearly straight, 4) hinge with 1distinct, somewhat hook-like cardinal and 1 small tubercular cardinal dorsally to it in the right valve, 1 obsolescent tubercular cardinal and 1 distinct, trigonal anterior cardinal in the left valve, 5) narrowly triangular, oblique and backward directed resilifer on a shelf-like projection and 6) outer surface with uneven growth markings. The shell outline is similar to that of the Hawaian *Scintilla hiloa* Dall, Bartsch & Rehder, 1938.
FOSSIL RECORDS: Holocene of Thailand.

Family *LASAEIDAE*
Subfamily *Lasaeinae*

Melliteryx puncticulata (Yokoyama, 1924)
Pl. 8, fig. 12
1954 *Melliteryx puncticulata* - Taki & Oyama, pl. 41, figs. 8, 9.
1960 *Melliteryx puncticulata flexuosa* Habe, p. 291, figs. 4, 5.
1968 *Melliteryx puncutulata* (sic!) - Habe, p. 184, pl. 57, fig. 4.
1971 *Melliteryx puncticulata* - Kuroda, Habe & Oyama, p. 406, pl. 119, fig. 7.
1977 *Melliteryx puncticulata* - Habe, p. 141, pl. 26, figs. 13, 14.
1990 *Melliteryx puncticulata* - Ito, p. 121, pl. 29, fig. 9.

The Thai specimens conform to the figure of *Melliteryx puncticulata flexuosa* published by HABE (1960) in that have 1) equilateral, trigonal shell attaining 7 mm in length, 2) hinge of the right valve with 1 subvertical cardinal and 2 distinct posterior laterals and 3) low radial folds toward the antero-ventral and postero-ventral margins. The surface, however, appears to be devoid of granules. The typical form lacks the radial folds.
DISTRIBUTION AND HABITAT. The species has been so far recorded from China Sea, Japanese and Korean waters. It occurs on fine sandy and muddy bottoms, intertidally and infralittorally (HABE, 1968; BERNARD et al., 1993).
FOSSIL RECORDS: Quaternary of Japan; Holocene of Thailand.

Parvikellia sp.
Pl. 9, fig. 1
The present unidentified species is featured by 1) polished, transversely rounded, small shell hardly reaching 2 mm in length, 2) anterior side slightly higher than the posterior one, 3) anterior and posterior margins long, gently arched and equally sloping and 4) hinge with 1 small cardinal tooth in each valve, 2 right and 1 left anterior laterals, 2 right and 1 left posterior laterals; the posterior laterals are more distant from the cardinal tooth. The Thai specimens seem to be conspecific with *Parvikellia* sp. figured by ITO (1990; pl. 29, fig. 7).
FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Erycininae*

"Erycina" lineata (Lynge, 1909)
Pl. 9, fig. 2
1909 *Kellya lineata* Lynge, p. 176, pl. 3, figs. 16-18.
1986 *Erycina (Erycina) lineata* - Beets, p. 124, pl. 11, figs. 17-22.

A single juvenile left valve, 1.5 mm long, thick, featured by 1) ovate-quadrangular, markedly inequilateral outline, 2) distinct radial depression resulting in a marked concavity of the ventral margin, 3) hinge with 2 cardinal teeth, 1 strong anterior lateral, 1 elongate posterior lateral, 4) posterior adductor scar extending along the dorsal margin, 5) sculpture of strong, even, closely set commarginal cords. The present specimen does not fit in satisfactorily with the characters of any erycinine genus. It is provisionally assigned to *Erycina* Lamarck, 1805.
DISTRIBUTION AND HABITAT. *"Erycina" lineata* is an epibyssate element hitherto known from the Gulf of Thailand and Singapore. In the Gulf of Thailand, it was recovered from muddy or shelly infralittoral substrates (LYNGE, 1909).
FOSSIL RECORDS: Pliocene or Quaternary (undetermined) of Indonesia.

Erycininae sp.
Pl. 9, fig. 3
A single right valve, 2.5 mm in length, featured by 1) trigonal, subequilateral outline, 2) hinge with 1 small cardinal tooth, 1 anterior and 1 posterior elongate laterals and 3) sculpture of evenly spaced commarginal threads. The hinge characters seem to be erycinine, but any assignment to genera is unsatisfactory.
FOSSIL RECORDS: Holocene of Thailand.

Family *MONTACUTIDAE*
Subfamily *Montacutinae*

Callomysia matsui Habe, 1951
Pl. 9, fig. 4
1969 *Barrimysia (Callomysia) matsui* - Treatise I. P., p. N529, fig. E 31 (5).
1977 *Callomysia matsui* - Habe, p. 148, pl. 27, figs. 6, 7.

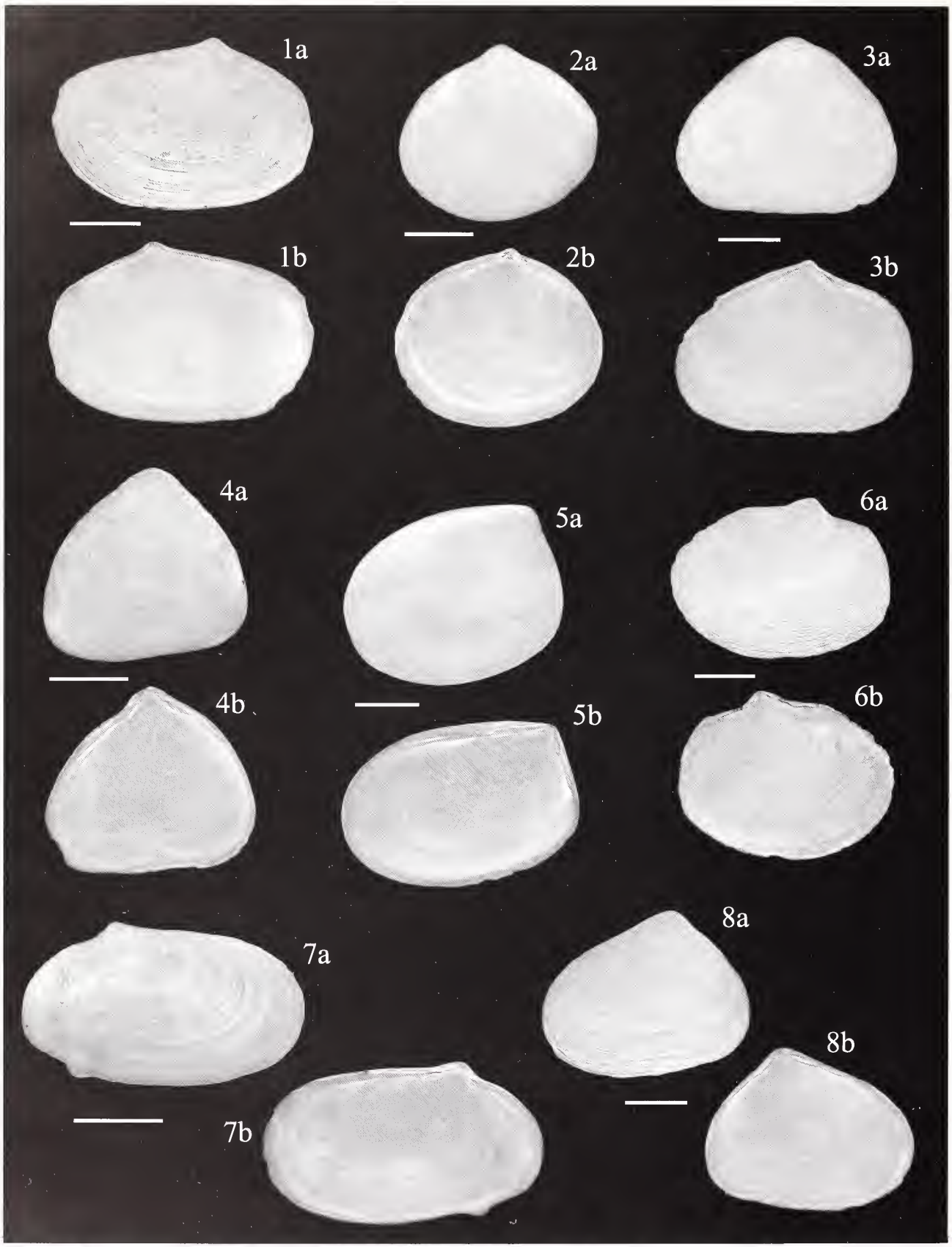

Plate 10: Figs. 1a, 1b. *Mysella costata* (Lynge, 1909), Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 1 mm. Figs. 2a, 2b. *Mysella mutsuwanensis* (Yamamoto & Habe, 1959), Station TH 28; scale bar 1 mm. Figs. 3a, 3b. *Mysella rudis* (Lynge, 1909), Station TH 108; scale bar 1 mm. Figs. 4a, 4b. *Mysella variabilis* (Lynge, 1909), Station TH 103; scale bar 2 mm. Figs. 5a, 5b. *Mysella* sp. 1, Station TH 40; scale bar 0.5 mm. Figs. 6a, 6b. *Mysella* sp. 2, Station TH 24; scale bar 0.5 mm. Figs. 7a, 7b. *Mysella* sp. 3, Stations TH 76, TH 73; scale bar 1 mm. Figs. 8a, 8b. *Mysella* sp. 4, Station TH 55; scale bar 1 mm.

The present incomplete left valve is 5 mm long and is characterized by 1) subquadrangular transverse, inequilateral outline, 2) anterior side about 1/2 of the posterior one, 3) hinge with 2 divergent, strong lateral teeth, 4) trigonal ligament pit under beak, 5) coarse crenulation of the inner margin and 6) outer surface with uneven growth markings and oblique, low radial folds toward the antero-dorsal and postero-dorsal margins. The Thai specimen appears to conform to the figures of *Callomysia matsui* published by HABE (1977).

DISTRIBUTION AND HABITAT. The species was based on Japanese material recovered from the infralittoral zone.

FOSSIL RECORDS: none recorded.

Curvemysella arcuata (Adams, 1856)

Pl. 9, fig. 5

1856 *Pythina arcuata* Adams, p. 47.
1932 *Montacuta (Mysella) arcuata* - Prashad, p. 172, pl. 5, figs. 31, 32.

Curvemysella arcuata is featured by 1) transversely elongated, slightly inequivalve, triangular shell attaining 8 mm in length, 2) blunt posterior radial angulation, 3) ventral margin triflingly concave and 4) surface with fine growth lines. It differs from the related *Curvemysella paula* (Adams, 1856) in having different shape, longer and less attenuated anterior side which is devoid or radial angulation and longer right anterior laminar tooth.

DISTRIBUTION AND HABITAT. The species is known from the Philippines. In the type-locality, it was recovered from sandy mud at a depth of about 5 m, adhering to *Lingula anatina*.

FOSSIL RECORDS: Holocene of Thailand.

Curvemysella paula (Adams, 1856)

Pl. 9, fig. 6

1856 *Pythina paula* Adams, p. 47.
1885 *Montacuta paula* - Smith, p. 203, pl. 12, figs. 1, 1b.
1909 *Montacuta (Tellimya) paula* - Lynge, p. 182.
1932 *Montacuta (Mysella) paula* - Prashad, p. 172.
1965 *Curvemysella paula* - Kira, p. 211, pl. 72, fig. 8.
1969 *Curvemysella paula* - Treatise I. P., p. 529, fig. E33 (1).
1977 *Curvemysella paula* - Habe, p. 148, pl. 27, figs. 10, 11.
1981 *Curvemysella paula* - Poutiers, p. 334.
1990 *Curvemysella paula* - Ito, p. 121, pl. 30, fig. 6.
1992 *Curvimysella paula* - Oliver, p. 111.
1995 *Curvemysella peculiaris* - Bosch, Dance, Moolenbeek & Oliver, p. 239, fig. 1051.
1995 *Curvemysella paula* - Scott, p. 42, fig. in same page, right.
1998 *Curvemysella paula* - Lamprell & Healy, p. 160, fig. 431.

Curvemysella paula is readily recognized on the basis of 1) inequivalve, transversely elongated, slightly distorted, crescent-shaped shell attaining 9 mm in length, 2) distinct anterior and posterior radial angulations, 3) middle part depressed, 4) ventral margin increasingly concave during growth and 5) surface with fine growth lines. The shell shape is the most distinctive feature.

DISTRIBUTION AND HABITAT. The species is widely distributed in the tropical Indo-Pacific, from the Gulf of Aden to Indonesia as far as the Torres Strait, and northward to Japan. *Curvemysella paula* is an intertidal and subtidal element, adapted to the symbiotic life with the hermit crabs (KIRA, 1965; ITO, 1990; BERNARD et al., 1993; BOSCH et al., 1995). In the Gulf of Thailand it was recorded from tidal flats seaward to the mangrove forest and down to a depth of 9 m (LYNGE, 1909); recent records are from muddy bottoms 60-70 m deep (SCOTT, 1995).

FOSSIL RECORDS: Holocene of Thailand.

Fronsella sp.

Pl. 9, fig. 7

The present unidentified species has 1) oval, inequilateral, small shell attaining 4 mm in length, 2) anterior side somewhat longer than the posterior one, 3) hinge with 1 pointed anterior tooth in each valve, 4) broad ligamentary indentation under beaks and 5) outer surface convex, with fine growth marks. *Fronsella oshimai* Habe, 1958 is similar, but seems to have a more attenuated anterior side at least.

FOSSIL RECORDS: Holocene of Thailand.

Tellimya sp. 1

Pl. 9, fig. 8

Some left valves attaining 4mm in length are in hand. The diagnostic features are 1) elongately oval, inflated, markedly inequilateral thin shell, 2) anterior side regularly rounded, twice the lenght of the posterior one which is quickly attenuated, 3) hinge with small rudimentary tooth just anterior to the beak, 4) subvertical strong chondrophore immediately behind beaks, 5) anterior adductor scar above midline, posterior one below it and 6) outer surface with fine growth lines and faint radial striation.

FOSSIL RECORDS: Holocene of Thailand.

Tellimya sp. 2

Pl. 9, fig. 9

One right valve 1.5 mm long is in hand. The present species differs from *Tellimya* sp. 1 in that has 1) more distinctly oval, less inflated shell, 2) shorter, somewhat truncated posterior side and 3) larger prodissoconch.

FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Mysellinae*

Mysella costata (Lynge, 1909)

Pl. 10, fig. 1

1909 *Montacuta costata* Lynge, p. 181, pl. 3, fig. 27.

Mysella costata is characterized by 1) oval-elongated, inequilateral shell attaining 5 mm in length, 2) anterior side quickly sloping, distinctly shorter than the oval posterior one, 3) hinge of the right valve with 2 diverging laterals appearing as moderate projections of the hinge line, 4) triangular resilial pit just under the beak and 5) outer surface with coarse growth markings and a radial angulation extending from the beak to the antero-ventral corner.

DISTRIBUTION AND HABITAT. The original material was recovered in the Gulf of Thailand from a bottom of sand and mud at a depth of 54 m (LYNGE, 1909).

FOSSIL RECORDS: Holocene of Thailand.

Mysella mutsuwanensis (Yamamoto & Habe, 1959)

Pl. 10, fig. 2

1969 *Montacutona mutsuwanensis* - Treatise I. P., p. N531, fig. E33 (2).
1971 *Montacutona mutsuwanensis* - Kuroda, Habe & Oyama, p. 409, pl. 120, fig. 1.
1971 *Montacutona ceriantha* Ponder, p. 17, figs. 1, 5-7.

1977 *Montacutona olivacea* - Habe, p. 146, pl. 28, figs. 1, 2.
1977 *Montacutona mutsuwanensis* - Inaba & Oyama, p. 80, pl. 4, fig. 7.
1977 *Montacutona tanakai* - Inaba & Oyama, p. 119, pl. 4, fig. 5.
1990 *Montacutona olivacea* - Ito, p. 121, pl. 30, fig. 2.
1998 *Montacutona mutsuwanensis* - Lamprell & Healy, p. 160, fig. 435.

Mysella mutsuwanensis is featured by 1) broadly oval, slightly inequilateral, small shell not exceeding 5 mm in length, 2) somewhat attenuated anterior side, 3) hinge with 2 diverging, short laterals in each valve, prominent and separated from the margin by a groove in the left valve, appearing as moderate projections of the hinge line in the right valve, 4) triangular ligament pit just under beaks, 5) adductor scars above midline, the anterior one distinctly smaller and 6) outer surface gently convex, with fine growth lines. The present species was selected for the type of the genus *Montacutona* Yamamoto & Habe, 1959. This genus exhibits only trifling differences from *Mysella* Angas, 1877 and seems to be unnecessary.
DISTRIBUTION AND HABITAT. *Mysella mutsuwanensis* ranges from Australia to Japan. It occurs on intertidal and subtidal muddy substrates, commensal with the anthozoan *Cerianthus filiformis* (BERNARD et al., 1993).
FOSSIL RECORDS: none recorded.

Mysella rudis (Lynge, 1909)
Pl. 10, fig. 3

1909 *Montacuta (Tellimya) rudis* Lynge, p. 184, pl. 3, figs. 33, 34.

Mysella rudis is featured by 1) transversely trigono-elliptical, rather convex, small shell not exceeding 7.5 mm in length, 2) short, subtruncate anterior part, 3) oval, attenuated posterior part, 4) sharp postero-dorsal angulation in the right valve, 5) shallow, reverse v-shaped ligament pit under beaks and 6) hinge and outer surface characters similar to those of *Mysella variabilis* (Lynge, 1909). *Mysella rudis* differs from *Mysella variabilis* in having longer, more inequilateral shell, subtruncate anterior side and stronger, more oblique left laterals.
DISTRIBUTION AND HABITAT. *Mysella rudis* is so far known from the Gulf of Thailand. It was reported to occur in holes in coral blocks at a depth of about 21 m (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Mysella variabilis (Lynge, 1909)
Pl. 10, fig. 4

1909 *Montacuta (Tellimya) variabilis* Lynge, p. 183, pl. 3, figs. 30-32.

Mysella variabilis is featured by 1) triangular to ovate-triangular, more or less inequilateral, small shell not exceeding 7 mm in length, 2) anterior and posterior margins quickly sloping, 3) hinge with 2 diverging laterals in each valve, prominent and separated from the margin by a groove in the left valve, appearing as extensions of the hinge line in the right valve, 4) trigonal ligament pit just under beaks and 5) outer surface with usually coarse, irregular growth marks. The shell outline appears to be rather variable and the ventral margin may change from slightly concave to straight or slightly convex.
DISTRIBUTION AND HABITAT. The species was based on material recovered south of Koh Chang in the Gulf of Thailand. It seems to be related primarily to muddy substrates.
FOSSIL RECORDS: Holocene of Thailand.

Mysella sp. 1
Pl. 10, fig. 5

The present uniditentified species is featured by 1) ovate-triangular *Nucula*-like, smooth and very small shell not exceeding 3 mm in length, 2) anterior side exceedingly short, truncated, 3) posterior side long, oval, 4) anterior and postero-dorsal margins forming a nearly right angle, 5) hinge as for the genus and 6) shallow, triangular ligament pit under beaks. *Mysella japonica* (Adams, 1864) is shorter and regularly oval in outline. *Mysella oblongata* (Yokoyama, 1920) differs in having longer shell and less sharply truncated anterior side.
FOSSIL RECORDS: Holocene of Thailand.

Mysella sp. 2
Pl. 10, fig. 6

A single, 2 mm long right valve is in hand. The main characters are 1) subelliptical, inequilateral shell, 2) short, truncated anterior side, 3) longer, oval posterior side, 4) anterior and posterior laterals somewhat arched, appearing as extensions of the hinge line and 5) outer surface with closely set, discontinuous and slightly undulating, commarginal threads. No related Indo-Pacific species has been noted.

Mysella sp. 3
Pl. 10, fig. 7

The present species is featured by 1) oblong, markedly inequilateral, small shell not exceeding 4 mm in length, 2) anterior part 1/2 of the posterior one, 2) antero-dorsal and postero-dorsal margins forming a nearly straight angle, 3) hinge with 2 diverging laterals in each valve, short, prominent and separated from the margin by a groove in the left valve, longer, appearing as extensions of the hinge line in the right valve, 4) deeply sunken, triangular ligament pit just under the beaks and 5) outer surface bearing fine growth lines, single, blunt anterior radial fold and an exceedingly faint radial striation. The anterior radial fold stands as the most distinctive character. *Mysella oblongata* (Yokoyama, 1922) appears to be closely related, but has shorter anterior side and lacks the anterior radial fold.
FOSSIL RECORDS: Holocene of Thailand.

Mysella sp. 4
Pl. 10, fig. 8

A single, 3 mm long right valve featured by 1) moderately oblong, ovate-triangular outline, 2) short, subtriangular anterior side, 3) oval posterior side which is twice as long as the anterior one, 4) hinge with 2 long, diverging lateral teeth appearing as extensions of the hinge line and 5) outer surface bearing fine growth markings. This unidentified species superficially resembles *Mysella rudis* (Lynge, 1909), but is devoid of any postero-dorsal angulation and has less coarse growth markings.

Superfamily CARDITOIDEA
Family *CARDITIDAE*
Subfamily *Carditamerinae*

Carditella (Carditellona) pulchella Lynge, 1909
Pl. 11, fig. 1

1909 *Carditella pulchella* Lynge, p. 164, pl. 3, figs. 6-8.
1935 *Carditella pulchella* - Oostingh, p. 167.

1952a *Carditellona hanzawai* - Habe, p.128, pl. 18, figs. 17, 18.
1968 *Carditellona pulchella* - Habe, p. 180, pl. 56, fig. 2.

Carditella pulchella is readily recognized on account of 1) ovate-triangular, thick and small shell not exceeding 3 mm in lenght, 2) subtruncate posterior end, 3) robust hinge with 1 right, 2 divergent left cardinals and 2 distant lateral teeth in each valve, 4) inner shell margin indented by ends of ribs and 5) sculpture of 13-14 strong radial ribs which are slightly wider than the intervening furrows and bear transversely elongated nodosities. *Carditella capensis* Smith, 1885 and *Carditella torresi* Smith, 1885 appear to be the most closely related species. The former differs in having 18 ribs, the latter has 15 riblets which are as wide as one half their interspaces. According to HABE (1968), *Cardium hanzawai* Nomura, 1933 is a synonym.

DISTRIBUTION AND HABITAT. *Carditella pulchella* was so far recorded from the Gulf of Thailand and Japanese waters. It occurs in sandy or shelly bottoms, occasionally in mud, at depths of from 2 to 54 m (LYNGE, 1909; HABE, 1968).

FOSSIL RECORDS: Pliocene of Indonesia and Taiwan.

Choniocardia (Carditellopsis) pusilla (Lynge, 1909)

Pl. 11, fig. 2

1909 *Carditella pusilla* Lynge, p. 164, pl. 3, figs. 3-5.
1952a *Carditellopsis toneana* - Habe, p. 128, pl. 18, fig. 16.
1954 *Carditella toneana* - Taki & Oyama, pl. 33, figs. 6, 7.
1968 *Carditellopsis toneana* - Habe, p. 180, pl. 56, fig. 1.

Choniocardia pusilla is featured by 1) rounded-trigonal, solid, small shell not exceeding 2.5 mm in lenght, 2) broad, smooth lunule and 3) sculpture of 12-13 broad, flattened radial ribs which are remarkably wider than their interspaces and are crossed by evenly spaced, closely set thin and shallow commarginal furrows. *Carditellopsis toneana* (Yokoyama, 1922) appears to be indistinguishable from the present species and is herein regarded as a synonym of it. *Carditella infans* Smith, 1885 is a related species differing primarily in that has 18 ribs.

DISTRIBUTION AND HABITAT. *Choniocardia pusilla* is hitherto known from the Gulf of Thailand and Japanese waters. It is reported to occur on sandy, stony or shelly bottoms, from the low tide mark down to about 70 m depth (LYNGE, 1909; HABE, 1968 sub *Carditellopsis toneana*).

FOSSIL RECORDS: Pliocene of Taiwan; Quaternary of Japan.

Superfamily CHAMOIDEA
Family *CHAMIDAE*

Chama asperella Lamarck, 1819

Pl. 11, figs. 3, 4

1917b *Chama asperella* - Lamy, p. 264.
1962 *Chama asperella* - Dey, p. 26, pl. 3, figs. 4, 5.
1964 *Chama asperella* - Spry, p. 28.
1973 *Chama asperella* - Selli, p. 214, pl. 8, figs. 1, 2.
1976a *Chama asperella* - Nielsen, p. 5, fig. 50.
1979 *Chama asperella* - Tantanasiriwong, p. 8.
1981 *Chama asperella* - Poutiers, p. 333.
1988 *Chama asperella* - Drivas & Jay, p. 142, pl. 56, fig. 7.
1992 *Chama asperella* - Oliver, p. 106, pl. 26, figs. 5, 6.
1992 *Chama asperella* - Lamprell & Whitehead, pl. 25, fig. 155.
1995 *Chama asperella* - Bosch, Dance, Moolenbeek & Oliver, p. 242, fig. 1069.

Chama asperella is featured by 1) irregularly oval, inequivalve shell attaining 45 mm in length, 2) attached left valve more convex than the right one, 3) inner margin finely crenulate and 4) sculpture of imbricate commarginal lamellae produced into more or less spatulate spiny projections which are finer and more crowded over the right valve. Fresh specimens are white and purple colored. *Chama jukesi* Reeve, 1847 is the most closely related species differing in that has higher shell, finer and more dense spiny projections and beaks tinged with pink color.

DISTRIBUTION AND HABITAT. The species is distributed in the tropical Indo-Pacific. It lives attached to hard substrates in the intertidal and infralittoral zones.

FOSSIL RECORDS: Lower Miocene of India; Middle Miocene of India and Indonesia; Late Miocene and Pliocene of Indonesia and Philippines; Quaternary of Indo-Pacific area; Holocene of Thailand.

Pseudochama scutulina Poutiers, 1981

Pl. 11, fig. 5

1981 *Pseudochama scutulina* Poutiers, p. 333, pl. 1, figs. 4, 5.

Pseudochama scutulina is a small-sized species sculptured with irregularly arranged, widely spaced concentric lamellae, those of the left valve bearing fine radial riblets. The lamellae of the attached right valve change into concave scales in the posterior part; a reticulated pattern may be observable in the lamellar interspaces of well preserved specimens.

DISTRIBUTION AND HABITAT. The species was reported to range from the Philippines to South China Sea (BERNARD et al., 1993). It attaches to hard substrates in the intertidal zone and down to 100 m depth (POUTIERS, 1981; BERNARD et al., 1993).

FOSSIL RECORDS: none recorded.

Superfamily CRASSATELLOIDEA
Family *CRASSATELLIDAE*
Subfamily *Crassatellinae*

Bathytormus radiatus (Sowerby, 1825)

Pl. 11, fig. 6

1842 *Crassatella radiata* - Reeve, p. 45.
1885 *Crassatella radiata* - Martin, p. 227, pl. 11, fig. 228.
1892 *Crassatella radiata* - Crosse & Fischer, p. 76.
1904 *Crassatella radiata* - Smith, p. 9.
1906 *Crassatella radiata* - Melvill & Standen, p. 814.
1909 *Crassatella radiata* - Lynge, p. 163.
1932 *Crassatella radiata* - Prashad, p. 141.
1979 *Crassatella radiata* - Tantanasiriwong, p. 9.
1995 *Bathytormus radiatus* - Bosch, Dance, Moolenbeek & Oliver, p. 243, fig. 1073.

Bathytormus radiatus differs from the related Indo-Pacific *Bathytormus foveolatus* (Sowerby, 1842) in having more inequilateral shell, sharp umbonal keel, stronger and more widely spaced concentric ridges.

DISTRIBUTION AND HABITAT. The species is reported to be common in the tropical Indo-Pacific, from the Red Sea to Southeast Asian waters (LYNGE, 1909; PRASHAD, 1932). It dwells in predominantly sandy infralittoral bottoms. Previous Thai records were from muddy, sandy and shelly substrates at depths of from 3 to 54 m (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Lower Miocene of Myanmar; Middle Miocene of

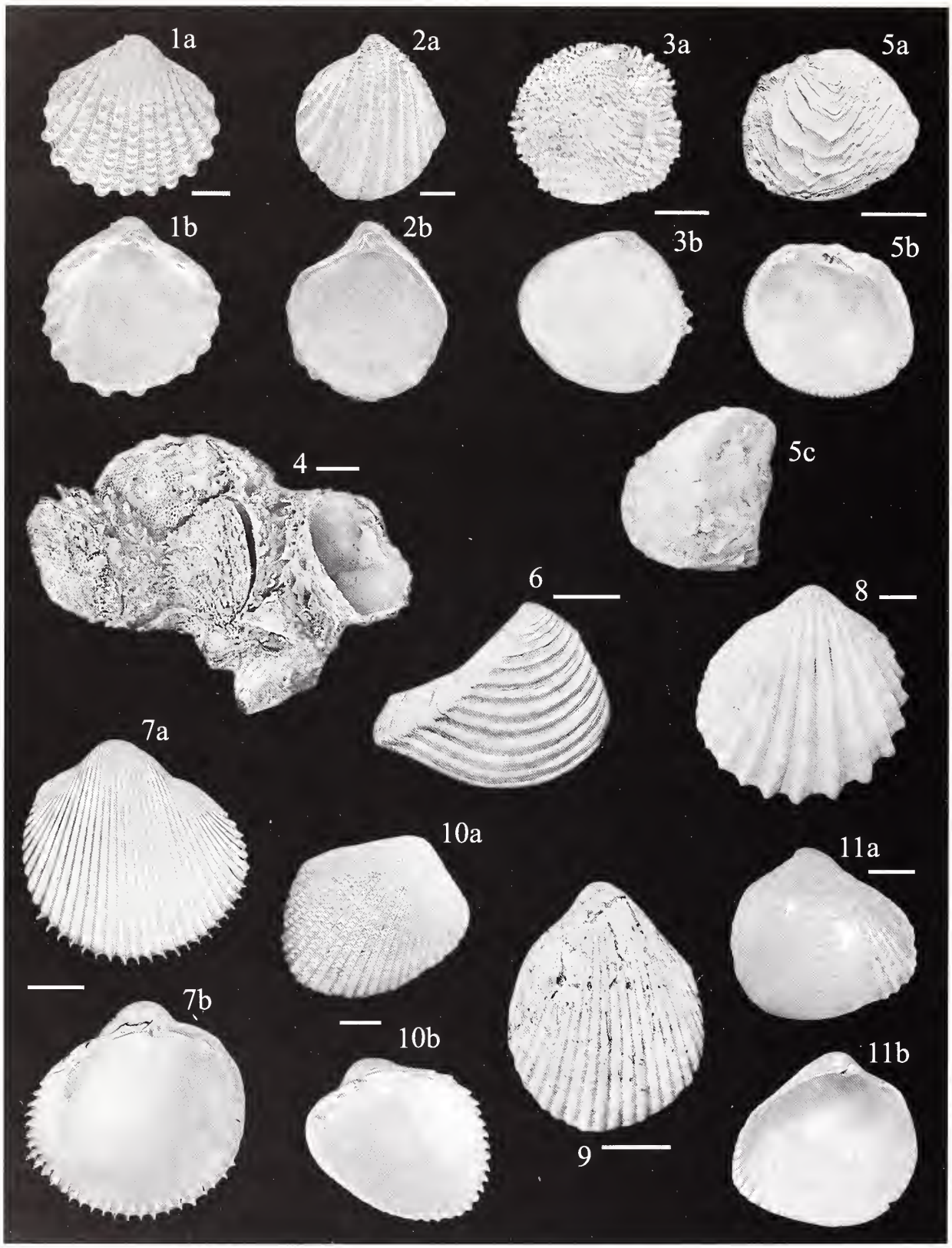

Plate 11: Figs. 1a, 1b. *Carditella (Carditellona) pulchella* Lynge, 1909, Station TH 108; scale bar 0.5 mm. Figs. 2a, 2b. *Chontocardia (Carditellopsis) pusilla* (Lynge, 1909), Station TH 108; scale bar 0.5 mm. Figs. 3a, 3b. *Chama asperella* Lamarck, 1819, trash-fish at Ban Laem Phak Bia; scale bar 5 mm. Fig. 4. *Chama asperella* Lamarck, 1819, trash-fish at Ban Laem Phak Bia; scale bar 5 mm. Figs. 5a, 5b, 5c. *Pseudochama scutulina* Poutiers, 1981, Station TH 108; scale bar 5 mm. Fig. 6. *Bathytormus radiatus* (Sowerby, 1825), Station TH 101; scale bar 5 mm. Figs. 7a, 7b. *Vepricardium coronatum* (Spengler, 1799), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 8. *Vepricardium sinense* (Sowerby, 1840), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 9. *Acrosterigma impolitum* (Sowerby, 1840), Locality TH 42 B, Holocene; scale bar 20 mm. Figs. 10a, 10b. *Afrocardium richardi* (Audouin, 1826), Station TH 108; scale bar 5 mm. Figs. 11a, 11b. *Fulvia hungerfordi* (Sowerby, 1901), Station TH 55; scale bar 2 mm.

Myanmar and Indonesia; Upper Miocene to Pliocene of Indonesia and Philippines; Quaternary of Indonesia; Holocene of Thailand.

Superfamily CARDIOIDEA
Family *CARDIIDAE*
Subfamily *Cardiinae*

Vepricardium coronatum (Spengler, 1799)
Pl.11, fig. 7

1881 *Cardium asiaticum* - Martin, p. 90, pl. 4, fig. 10.
1904 *Cardium coronatum* - Smith, p. 10.
1906 *Cardium (Acanthocardia) asiaticum* - Melvill & Standen, p. 838.
1909 *Cardium (Bucardium) asiaticum* - Lynge, p. 255.
1909 *Cardium (Bucardium) coronatum* - Lynge, p. 255.
1939 *Cardium (Acanthocardium) asiaticum* - Adam & Leloup, p. 73.
1956 *Cardium asiaticum* - Satyamurti, p. 92, pl. 14, fig. 2.
1977 *Laevicardium (Vepricardium) coronatum* - Fischer-Piette, p. 41, pl. 3, fig. 3.
1977 *Cardium mirable* (sic) - Wilson & Stevenson, pl.1, fig. 6.
1977 *Veprecardium asiaticum* - Wilson & Stevenson, pl.1, fig. 7.
1981 *Cardium asiaticum* - Richards, p. 83, pl. 53, fig. 468.
1982 *Trachycardium asiaticum* - Abbott & Dance, p. 330, fig. in mid lower row, left.
1992 *Bucardium coronatum* - Oliver, p. 124, pl. 22, fig. 11.
1994 *Bucardium asiaticum* - Scott, p. 77, pl. 9, fig. A.
1995 *Bucardium coronatum* - Bosch, Dance, Moolenbeek & Oliver, p. 244, fig. 1076.

This is a common species featured by 1) slightly inequilateral, rather tumid shell attaining 35 mm in length, 2) subcircular outline, 3) short, subtruncate anterior side, 4) crenulate inner margin and 5) sculpture of 31-36 radial ribs which are wider than the flat intervening spaces; crested lamellar processes arising from the posterior side of ribs are noted on lower half of the shell, stronger on posterior ribs. This latter feature appears to be the most distinctive character.

DISTRIBUTION AND HABITAT. *Vepricardium coronatum* is an intertidal and infralittoral element widely distributed in the tropical Indo-Pacific, from South Africa to Indonesia and northward to Japan (FISCHER-PIETTE, 1977; BERNARD et al. 1993). In southeastern Asian waters it was reported to occur subtidally down to 54 m on muddy, sandy or mixed bottoms (LYNGE, 1909; TANTANASIRIWONG, 1979; MORRIS & PURCHON, 1981).

FOSSIL RECORDS: Upper Miocene of Malaysia and Indonesia; ? Pliocene of Malaysia and Indonesia; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Vepricardium sinense (Sowerby, 1840)
Pl. 11, fig. 8

1840 *Cardium sinense* Sowerby, p. 105.
1909 *Cardium (Bucardium) sinense* - Lynge, p. 256.
1960 *Cardium sinense* - Thang Xi, Qi Zhong Yan, Li Jemin, Ma Xiutong, Wang Zhen Rui, Huang Xiuming & Zhuang Qiqian, p. 130, fig. 108.
1965 *Vepricardium sinense* - Kira, p. 156, pl. 56, fig. 6.
1977 *Laevicardium (Vepricardium) sinense* - Fischer-Piette, p. 43.
1992 *Vepricardium sinense* - Dharma, p. 88, pl. 22, fig. 12.
1994 *Vepricardium sinense* - Scott, p. 78, pl. 9, fig. C.

The present species resembles *Vepricardium coronatum* (Spengler, 1799) in terms of general shape and size, but differs in having 1) less tumid shell, 2) less numerous (21-28), distinctly angular radial ribs, 3) less developed lamellar processes and 4) small spiny tubercles all-over.

DISTRIBUTION AND HABITAT. *Vepricardium sinense* is a sand-related infralittoral element ranging from Thailand and Philippines to Taiwan and Hong Kong. In the Gulf of Thailand, it was recorded from mud and shelly mud, at depths of 5-54 m (LYNGE, 1909).

FOSSIL RECORDS: Pliocene of Indonesia and Taiwan; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Subfamily *Trachycardiinae*

Acrosterigma impolitum (Sowerby, 1840)
Pl. 11, fig. 9

1840 *Cardium impolitum* Sowerby, p. 107.
1909 *Cardium (Trachycardium) impolitum* - Lynge, p. 257.
1932 *Cardium (Trachycardium) impolitum* - Prashad, p. 269.
1977 *Laevicardium (Trachycardium) impolitum* - Fischer-Piette, p. 67.
1992 *Acrosterigma impolita* - Lamprell & Whitehead, n. 198, pl. 30, fig. 198.
1997 *Trachycardium impolitum* - Oliver & Chesney, figs. 27, 28, 33-36.

Acrosterigma impolitum is featured by 1) higher than long, oval shell attaining 45 mm in height, 2) small, slightly prosogyrate beaks, 3) distinctly bent hinge line and 4) sculpture of 31 low radial ribs twice as wide as the intervening furrows, anterior ribs crenate, posterior ones noded at the posterior edge.

DISTRIBUTION AND HABITAT. The species is distributed in the Indo-Pacific, from Pakistan to Australia and New Caledonia, and northward to South China Sea. It occurs in sand, intertidally and down to 25 m depth (BERNARD et al., 1993). Previous records in the Gulf of Thailand were from shelly bottoms 8-54 m deep (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Subfamily *Fraginae*

Afrocardium richardi (Audouin, 1826)
Pl. 11, fig. 10

1909 *Hemicardium (Fragum) carditaeforme* - Lynge, p. 261, pl. 5, figs. 21, 22.
1927 *Cardium (Parvicardium) richardi* - Lamy, p. 518.
1932 *Cardium (Fragum) carditaeforme* - Prashad, p. 272.
1954 *Afrocardium ebaranum* - Taki & Oyama, pl. 45, fig. 15.
1977 *Papyridea (Papyridea) hiulca* - Fischer-Piette, p. 74, pl. 9, figs. 1, 2.
1977 *Cardium (Parvicardium) richardi* - Fischer-Piette, p. 89.
1977 *Corculum (Afrocardium) carditaeforme* - Fischer-Piette, p. 114.
1982 *Cardium richardi* - Bouchet & Danrigal, p. 14, fig. 14.
1992 *Afrocardium richardi* - Oliver, p. 122, pl. 21, fig. 8 (*cum syn.*).
1995 *Afrocardium richardi* - Bosch, Dance, Moolenbeek & Oliver, p. 244, fig. 1080.

This small (up to 10 mm) distinctive cockle is featured by 1) markedly oblique, submodioliform shell and 2) sculpture of 35-36 low, scaly ribs thrice as wide as the intervening furrows. Scales are crowded, slightly oblique and concave-down. *Cardium carditaeforme* Reeve, 1845, *Cardium hiulcum* Reeve, 1845 and *Cardium ebaranum* Yokoyama, 1927 are junior synonyms.

DISTRIBUTION AND HABITAT. *Afrocardium richardi* ranges in the Indo-Pacific, from the Red Sea to the Philippines and Japan. It occurs intertidally and down to 60 m depth in coarse sand (BERNARD et al., 1993). Previous records in the Gulf of Thailand were from sandy and shelly bottoms 9-68 m deep (LYNGE, 1909 sub *Hemicardium carditaeforme*).

FOSSIL RECORDS: none recorded.

Subfamily *Laevicardiinae*

Fulvia hungerfordi (Sowerby, 1901)
Pl. 11, fig. 11

1904 *Cardium hungerfordi* - Pilsbry, p. 555, pl. 41, fig. 17
1904 *Cardium hungerfordi* var. *undatopictum* Pilsbry, p. 556, pl. 40, figs. 14, 15.

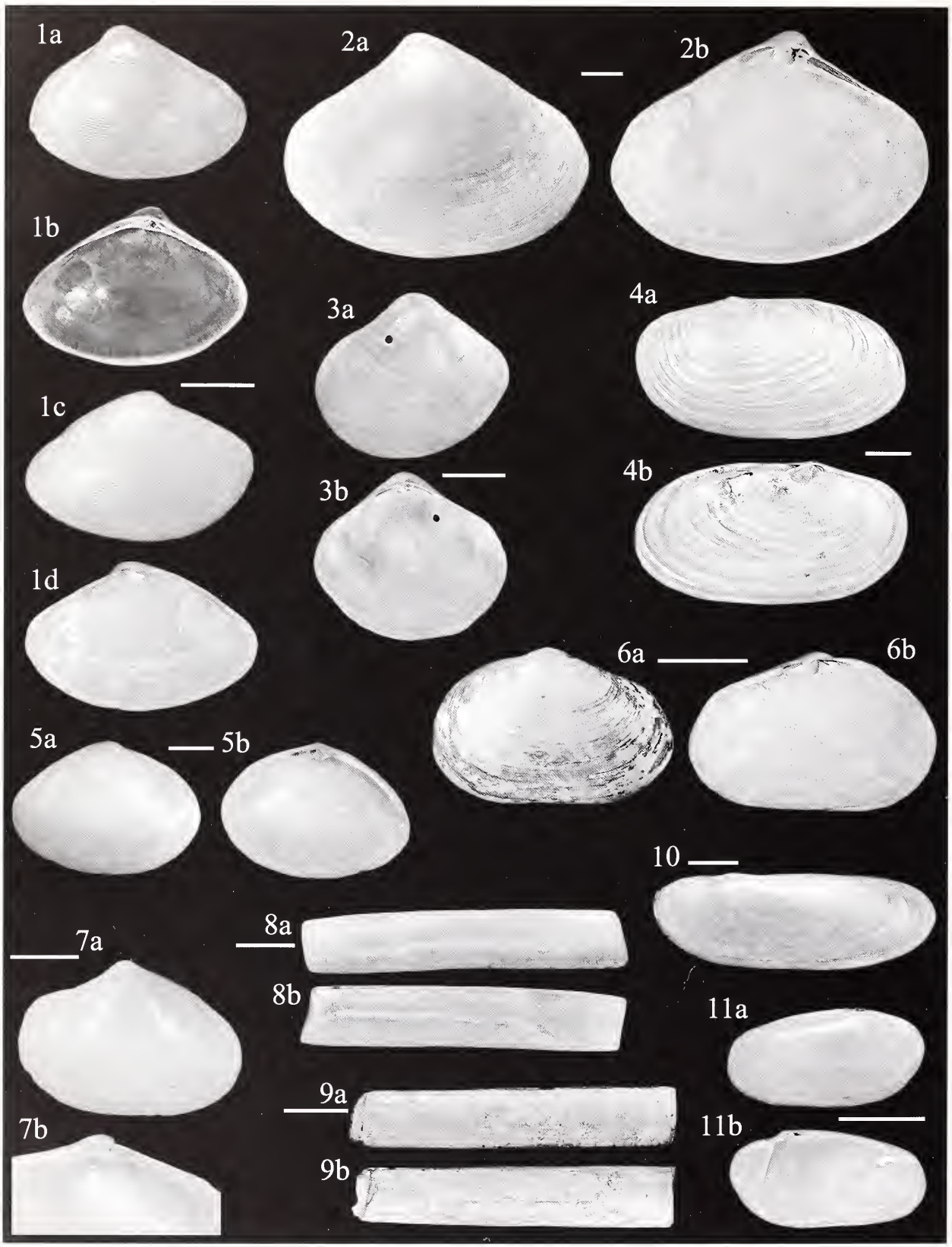

Plate 12: Figs. 1a, 1b, 1c, 1d. *Mactra (Mactra) luzonica* Deshayes, 1854, Station TH 79; scale bar 10 mm. Figs. 2a, 2b. *Mactra (Mactra) violacea* Gmelin, 1791, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 3a, 3b. *Mactra* sp., Station TH 41; scale bar 5 mm. Figs. 4a, 4b. *Lutraria (Lutrophora) complanata* (Gmelin, 1791), Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 10 mm. Figs. 5a, 5b. *Heterocardia gibbosula* Deshayes, 1854, Station TH 11; scale bar 2 mm. Figs. 6a, 6b. *Meropesta pellucida* (Gmelin, 1791), Station TH 79; scale bar 5 mm. Figs. 7a, 7b. *Raeta (Raetellops) pulchella* (Adams & Reeve, 1850), Station TH 56; scale bar 5 mm. Figs. 8a, 8b. *Solen corneus* Lamarck, 1818, Station TH 25; scale bar 10 mm. Figs. 9a, 9b. *Solen* sp., Ban Ko, sample NC1, Holocene; scale bar 10 mm. Fig. 10. *Cultellus lacteus* (Spengler, 1794), Station TH 115; scale bar 10 mm. Figs. 11a, 11b. *Siliqua minima* (Gmelin, 1791), Ban Ko, sample NC1, Holocene; scale bar 10 mm.

1904 *Cardium hungerfordi* var. *stigmaticum* Pilsbry, p. 556, pl. 41, figs. 13, 14.
1909 *Cardium (Papyridea) hungerfordi* - Lynge, p. 259.
1932 *Cardium (Papyridea) hungerfordi* - Prashad, p. 281.
1965 *Fulvia hungerfordi* - Kira, p. 153, pl. 55, fig. 1.
1977 *Fulvia hungerfordi* - Habe, p. 175, pl. 31, fig. 12.
1989 *Fulvia hungerfordi* - Ito, p. 63, pl. 24, fig. 8.

Fulvia hungerfordi is distinguished by 1) subcircular, rather tumid, inequilateral and thin shell attaining 12 mm in length, 2) broadly rounded anterior part, 3) tapering, subtruncate posterior part and 4) sculpture of low, rounded anterior and posterior radial ribs, middle part devoid of ribs; minute granules are noted on posterior slope.
DISTRIBUTION AND HABITAT. The species is distributed from Southeast Asia to Japan and occurs abundantly in sheltered intertidal and infralittoral muddy and sandy bottoms (KIRA, 1965; BERNARD et al., 1993). In the Gulf of Thailand it was recovered from sandy and muddy bottoms at depths of 2-54 m (LYNGE, 1909). According to REID & SHIN (1985), *Fulvia hungerfordi* requires turbid waters.
FOSSIL RECORDS: Holocene of Thailand.

Superfamily MACTROIDEA
Family *MACTRIDAE*
Subafamily *Mactrinae*

Mactra (Mactra) luzonica Deshayes, 1854

Pl. 12, fig. 1

1854a *Mactra luzonica* Deshayes, p. 64.
1906 *Mactra luzonica* - Melvill & Standen, p. 827.
1909 *Mactra (Trigonella) luzonica* - Lynge, p. 221.
1917c *Mactra luzonica* - Lamy, p. 227.
1992 *Mactra (Mactra) luzonica* - Lamprell & Whitehead, n. 257, pl. 37, fig. 257.

The species is recognized on account of 1) ovate-triangular, slightly inequilateral shell attaining 50 mm in length, 2) nearly straight antero-dorsal and postero-dorsal margins, 3) narrow and shallow pallial sinus, 4) sculpture of uneven commarginal shallow grooves and 5) umbonal area and inner surface light violet. The Thai shells conform to the original material in BMNH. It is of note that *Mactra luzonica* is regarded by some authors as a synonym of *Mactra lilacea* (Lamarck, 1818).
DISTRIBUTION AND HABITAT. *Mactra luzonica* is distributed from Pakistan to Australia and northward to South China Sea. It dwells in muddy and sandy infralittoral substrates.
FOSSIL RECORDS: Holocene of Thailand.

Mactra (Mactra) violacea Gmelin, 1791

Pl. 12, fig. 2

1917c *Mactra (Coelomactra) violacea* - Lamy, p. 238.
1956 *Mactra violacea* - Satyamurti, p. 141, pl. 21, fig. 5.
1969 *Mactra (Coelomactra) violacea* - Treatise I. P., p. N596, fig. E92 (6).
1982 *Mactra violacea* - Abbott & Dance, p. 333, fig. in bottom row, left.
1992 *Mactra violacea* - Dharma, p. 92, pl. 24, fig. 1.

The species is featured by 1) ovate-trigonal, rather elongate, subequilateral shell up to 96 mm in length, 2) lunule leaf-shaped, gradually tapering, escutcheon lanceolate, 3) postero-dorsal margin nearly straight, forming an obscure angle with the short posterior one, 4) anterior arm of the cardinal tooth linked to the valve margin, 5) pallial sinus short and wide, 6) outer surface with commarginal growth lines; fresh specimens have the umbonal area tinged with violet.
DISTRIBUTION AND HABITAT. *Mactra violacea* is distributed from eastern Indian Ocean to Philippines. It is a shallow water element dwelling in sand.
FOSSIL RECORDS: none recorded.

Mactra sp.

Pl. 12, fig. 3

A few juvenile, thin, left valves attaining 11 mm in length were recovered, featured by 1) *Pinguitellina*-like outline, 2) oval anterior side, 3) posterior side shorter, quickly attenuated, subrostrate, with 2 thread-like umbonal keels, 4) hinge with inverted V-shaped cardinal tooth touching the anterior lateral, 5) resilifer small, drop-shaped, 6) pallial sinus short, extending to the level of the posterior lateral tooth, 7) outer surface light purple in color, with fine growth lines.

Subfamily *Lutrariinae*

Lutraria (Lutrophora) complanata (Gmelin, 1791)

Pl. 12, fig. 4

1917c *Lutraria planata* - Lamy, p. 376, fig. in p. 362.
1969 *Lutraria (Lutrophora) complanata* - Treatise I. P., p. 604, fig. E97 (2).
1984 *Lutraria (Lutrophora)* cf. *complanata* Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 2, fig. 5.

This is an uncommon species featured by 1) elongate-elliptical, markedly inequilateral thin shell attaining 70 mm in length, 2) anterior and posterior margins arched, 3) dorsal and ventral margins subparallel and 4) sculpture of broad and low, commarginal sharp undulations; uneven growth markings are noted all-over.
DISTRIBUTION AND HABITAT. The species ranges from India to Southeast Asia. It is presumed to be a shallow water, sand-related element.
FOSSIL RECORDS: Holocene of Thailand.

Heterocardia gibbosula Deshayes, 1854

Pl. 12, fig. 5

1858 *Heterocardia gibbosula* - Adams & Adams, p. 387, pl. 102, figs. 6, 6a.
1917c *Heterocardia gibbosula* - Lamy, p. 394.
1969 *Heterocardia gibbosula* - Treatise I. P., p. N604, fig. E97 (1).
1992 *Heterocardia gibbosula* - Lamprell & Whitehead, n. 275, pl. 40, fig. 275.

The species is featured by 1) ovate-triangular, inequilateral shell attaining 30 mm in length, 2) oval anterior side, subtriangular posterior side, 3) convex, subangular postero-dorsal margin, 4) pallial sinus narrow and deep, exceeding midline, with the lower border coinciding with the pallial line, 5) outer surface with uneven growth markings.
DISTRIBUTION AND HABITAT. *Heterocardia gibbosula* ranges from northern Australia to the Philippines. According to LAMPRELL & WHITEHEAD (1992), it occurs in littoral sand.
FOSSIL RECORDS: Holocene of Thailand.

Meropesta pellucida (Gmelin, 1791)

Pl. 12, fig. 6

1909 *Standella pellucida* - Lynge, p. 224.
1917c *Standella pellucida* - Lamy, p. 383, pl. 7, fig. 7; text fig. on page 382.
1968 *Standella pellucida* - Cheriyan, p. 133.
1992 *"Mactra" pellucida* - Lamprell & Whitehead, n. 274, pl. 39, fig. 274.
1995 *Meropesta pellucida* - Bosch, Dance, Moolenbeek & Oliver, p. 248, fig. 1100.

1996 *Mactra pellucida* - Jansen, p. 44, fig. 170.

The distinctive characters are 1) longer than high, inequilateral, elliptical shell attaining 80 mm in length, 2) anterior side oval, posterior one more narrowly so, 3) elongated anterior adductor scar, 4) pallial sinus moderately narrow, deep, reaching midline and 5) outer surface with uneven, fine growth markings and faint posterior radial striation; an exceedingly shallow radial depression is usually noted in the mid-anterior part.

DISTRIBUTION AND HABITAT. *Meropesta pellucida* ranges from the Persian Gulf to Australia and northward to China Sea. It occurs in intertidal muddy substrates (BERNARD et al., 1993). The species was reported to be common in the Cochin Harbour area (India) during the dry season, in stations with a silty bottom (CHERIYAN, 1968). In the Gulf of Thailand it was recorded at Koh Chang from the tidal flat seaward of the mangrove forest (LYNGE, 1909).

FOSSIL RECORDS: Quaternary of Indonesia; Holocene of Thailand.

Subfamily *Pteropsellinae*

Raeta (Raetellops) pulchella (Adams & Reeve, 1850)

Pl. 12, fig. 7

1885 *Raeta pulchella* - Smith, p. 56.
? 1909 *Raeta pulchella* - Lynge, p. 223, pl. 4, fig. 24.
1917c *Labiosa (Raeta) pulchella* - Lamy, p. 358.
1961 *Raeta (Raetellops) pulchella* - Hayasaka, p. 52, pl. 5, fig. 6.
1965 *Raeta (Raetellops) pulchella* - Kira, p. 167, pl. 59, fig. 1.
1969 *Raetella pulchella* - Harry, p. 17, figs. 16-19 (*cum syn.*).
1969 *Raeta (Raetellops) pulchella* - Treatise I. P., p. 606, fig. E98 (1).
1971 *Raetellops pulchella* - Kuroda, Habe & Oyama, p. 437, pl. 95, figs. 7, 8.
1977 *Raetellops pulchella* - Habe, p. 186, pl. 36, figs. 3, 4.
1980 *Raeta pulchella* - Volova & Scarlato, p. 70, fig. 67.
1983 *Raetellops pulchella* - Masuda, Hayasaka & Noda, p. 15, pl. 4, figs. 2-4.
1986 *Raetellops pulchella* - Takayasu, pl. 82, fig. 4.
1989 *Raetellops pulchella* - Ito, p. 63, pl. 24, fig. 13.
1993 *Raetellops pulchella* - Noda, Kikuchi & Nikaido, p. 155, fig. 21 (12).
1998 *Raetella pulchella* - Tsuchida, p. 93, pl. 4, fig. 7.
1998 *Raeta (Raetella) pulchella* - Lamprell & Healy, p. 246, fig. 746.

This distinctive species is characterized by 1) elliptical, inequilateral, thin shell hardly exceeding 20 mm in length, 2) rounded anterior side, subrostrate posterior one and 3) sculpture of broad and low commarginal undulations; a fine growth striation is noted all-over.

DISTRIBUTION AND HABITAT. *Raeta pulchella* appears to be distributed from Australia to Japan. It occurs intertidally and down to 120 m depth, in sand and mud (BERNARD et al., 1993). According to KIRA (1965), the species is very common in muddy bottoms in sheltered waters. Previous records in the Gulf of Thailand were from a 9 m deep muddy substrate (LYNGE, 1909).

FOSSIL RECORDS: Pliocene and Quaternary of Japan; Holocene of Thailand.

Superfamily SOLENOIDEA

Family *SOLENIDAE*

Solen corneus Lamarck, 1818

Pl. 12, fig. 8

1841 *Solen corneus* - Delessert, pl. 2, fig. 2.
Not 1847 *Solen corneus* - Philippi, p. 44, pl. 2, fig. 2 (= *Solen cylindraceus* Hanley, 1843).
? 1906 *Solen corneus* - Melvill & Standen, p. 844.
1909 *Solen corneus* - Lynge, p. 274.
1932a *Solen corneus* - Lamy, p. 428.
Not 1981 *Solen corneus* - Richards, p. 87, pl. 56, fig. 496 (= *Solen cylindraceus* Hanley, 1843).

This razor clam has 1) markedly elongate, straight, cylindrical shell attaining 100 mm in length, 2) obliquely truncated anterior end, 3) vertically truncated posterior side, 4) anterior margin thickened inside, without any outer furrow parallel to it, 5) sharp antero-ventral corner and 6) outer surface shining, with faint growth lines. *Solen strictus* Gould, 1861 was regarded by some workers (cf. KURODA et al., 1971; BERNARD et al., 1993) as a synonym of Lamarck's species. Actually, the West Pacific *Solen strictus* is a valid species, differing from *Solen corneus* in that has a comparatively longer shell at least.

DISTRIBUTION AND HABITAT. *Solen corneus* is distributed in the Indian and Southwest Pacific oceans, from South Africa to Japan. It dwells in intertidal muddy and sandy substrates (BERNARD et al., 1993). Previous records in the Gulf of Thailand were from the strand off the mangal (LYNGE, 1909).

FOSSIL RECORDS: Holocene of Thailand (sub *Solen malaccensis*).

Solen sp.

Pl. 12, fig. 9

Several small specimens were obtained from the Bangkok Clay. They are featured by 1) elongate, cylindrical shell not exceeding 50 mm in length, 2) dorsal and ventral margins straight and parallel, 3) anterior end obliquely truncated and somewhat constricted, 4) anterior margin slightly oblique, with a relatively wide rim preceded by a distinct furrow, 5) posterior end vertically truncated, 6) outer surface with fine growth lines. These shells exhibit a rather good resemblance to *Solen gracilis* Philippi, 1847 as figured by DUNKER (1858; pl. 24, fig. 3), but that species is said to be slightly rounded posteriorly.

FOSSIL RECORDS: Holocene of Thailand.

Family *CULTELLIDAE*

Cultellus lacteus (Spengler, 1794)

Pl. 12, fig. 10

1932 *Cultellus (Cultellus) maximus* - Prashad, p. 313.
1969 *Cultellus (Cultellus) lacteus* - Treatise I. P., p. 611, fig. E103 (2).
1979 *Cultellus lacteus* - Tantanasiriwong, p. 11.

The species is distinguished by 1) oblong-elliptical, inequilateral, thin and flat shell attaining 80 mm in length, 2) beaks approximately at the anterior one fourth, 3) rounded, slightly tapering anterior and posterior sides, this latter somewhat less so, 4) pallial sinus wide and shallow, 5) outer surface shining, with uneven growth lines.

DISTRIBUTION AND HABITAT. *Cultellus lacteus* is a superficial member of the infauna widely distributed in the tropical Indo-Pacific. It occurs in very soft mud, at and below low water mark of neap tides, in the seaward fringe of the mangrove forest in Malaya and Singapore and was also trawled from the mud along the sheltered west coast of Malaya (PURCHON & PURCHON, 1981). The species was observed to live on muddy sand flats in western Thai waters (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Holocene of Thailand.

Siliqua minima (Gmelin, 1791)

Pl. 12, fig. 11

1850 *Solen albida* Adams & Reeve, p. 84, pl. 23, fig. 15.
1909 *Siliqua minima* - Lynge, p. 278.
1960 *Siliqua albida* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 220, fig. 184.

Siliqua minima is readily distinguished on the basis of 1) ovate-rectangular, inequilateral, very thin and rather flat shell attaining 25 mm in length, 2) rounded anterior part, longer and somewhat attenuated posterior part, 3) pallial sinus widely rounded, deep, with the lower border coinciding with the pallial line, 4) inner rib thin, slightly oblique and 5) outer surface shiny, milky-white, with fine growth lines and exceedingly faint radial striation. The shell shape is the most distinctive character. *Siliqua pulchella* (Dunker, 1852) appears to be related, but has a slenderer shell.

Distribution and Habitat. The species ranges from India to China and Japan. It dwells in sand and mud in the intertidal zone and down to 30 m (Bernard et al., 1993). Purchon & Purchon (1981) quoted *Siliqua minima* (sub *Siliqua albida*) as an interesting member of the superficial infauna in the sublittoral mud along the west coast of Malaya.

Fossil records: Holocene of Thailand.

Superfamily Tellinoidea
Family *Tellinidae*
Subfamily *Tellininae*

Tellina (Angulus) emarginata (Sowerby, 1825)

Pl. 13, fig. 1

1872 *Tellina emarginata* - Römer, p. 177, pl. 36, figs. 1-3.
1909 *Tellina (Tellinides) carinata* - Lynge, p. 196.
1932 *Tellina (Tellina) emarginata* - Prashad, p. 182.
1992 *Tellina (Angulus) emarginata* - Lamprell & Whitehead, n. 337, pl. 46, fig. 337.
1995 *Tellinides emarginatus* - Bosch, Dance, Moolenbeek & Oliver, p. 253, fig. 1125.

Tellina emarginata is featured by 1) subelliptical, thin shell attaining 40 mm in length, 2) anterior side oval, slightly longer than the posterior one, 3) posterior end subtruncate and faintly bilobate, 4) postero-dorsal margin gently concave, 5) posterior area depressed, bounded by a blunt ridge, 6) hinge with 2 cardinals and 1 anterior lateral in the right valve, 1 cardinal in the left valve, 7) pallial sinus wide and deep, with angular upper border, almost touching the anterior adductor scar, 8) outer surface with fine growth lines and faint radial striation.

Distribution and Habitat. The species is widely distributed in the tropical Indo-Pacific, ranging from the Gulf of Oman to Australia northward to Japan. According to Bernard et al. (1993), it occurs in shell gravel at depths of from 30 to 60 m. In the Gulf of Thailand it was obtained from different substrates, at depths of 12-54 m (Lynge, 1909).

Fossil records: Holocene of Thailand.

Tellina (Angulus) vestalis Hanley, 1844

Pl. 13, fig. 2

1844b *Tellina vestalis* Hanley, p. 141.
Not 1871 *Tellina vestalis* - Römer, p. 174, pl. 35, figs. 9-11 (= *Tellina vestalioides* Yokoyama, 1920).
1909 *Tellina (Tellinides) vestalis* - Lynge, p. 198.
1994 *Tellina vestalis* - Scott, p. 88, pl. 12, fig. C; text-fig. 1C.

Tellina vestalis is featured by 1) elliptical, thin shell attaining 29 mm in length, 2) anterior side slightly longer than the posterior one, 3) posterior end subtruncate, 4) postero-dorsal margin slightly sinuous, 5) posterior area triflingly concave, bounded by a blunt angulation, 6) hinge with 2 cardinals and 1 anterior lateral in the right valve, 1 cardinal in the left valve, 7) pallial sinus half-confluent, wide and deep, with subangular upper border, produced anteriorly but not touching the anterior adductor scar, 8) outer surface with fine growth lines and faint radial striation. *Tellina vestalioides* Yokoyama, 1920 is strikingly similar, differing in that has somewhat less elongate shell with slightly steeper postero-dorsal margin.

Distribution and Habitat. The species ranges from Thailand to South China Sea. It occurs in infralittoral sandy and muddy bottoms (Bernard et al., 1993; Scott, 1994). Previous records in the Gulf of Thailand were from muddy substrates 10-27 m deep (Lynge, 1909).

Fossil records: Holocene of Thailand.

Tellina (Arcopella) casta Hanley, 1844

Pl. 13, fig. 5

1844b *Tellina casta* Hanley, p. 63.
1885 *Tellina (?) casta* - Smith, p. 109.
1909 *Tellina (Arcopagia ?) casta* - Lynge, p. 193.
1932 *Tellina (Arcopagia) casta* - Prashad, p. 187.
? 1992 *Tellina (Pinguitellina) casta* - Lamprell & Whitehead, n. 322, pl. 45, fig. 322.

Tellina casta is distinguished by 1) ovate-triangular, smooth shell up to 15 mm in lenght, 2) anterior end broadly rounded, 3) posterior end acuminate, biangulate, 4) left valve slightly more convex than the right, 5) beaks pointed, worn at the tip and 6) ligament partly internal. *Arcopella languida* Smith, 1885 is the most closely related species, but differs primarily in having a more inequilateral shell with longer anterior part.

Distribution and Habitat. *Tellina casta* ranges from Torres Strait northward to Thailand and South China Sea. It is reported to dwell in muddy bottoms 10-40 m deep (Bernard et al., 1993). Previous records in the Gulf of Thailand were from muddy or shell bottoms in the 2-36 m bathymetric interval (Lynge, 1909).

Fossil records: none recorded.

Tellina (Cadella) semen Hanley, 1844

Pl. 13, fig. 6

1844b *Tellina semen* Hanley, p. 164.
1885 *Tellina semen* - Smith, p. 111.
1906 *Tellina (Moera) semen* - Melvill & Standen, p. 821.
1909 *Tellina (Moerella) semen* - Lynge, p. 198.
1969 *Tellina (Cadella) semen* - Boss, p. 136, pl. 14, fig. 5; pl. 15, figs. 1-4.
1979 *Tellina (Cadella) oauhana* - Kay, p. 561, figs. 183 C, D.
1984 *Cadella semen* - Matsukuma, p. 24, pl. 4, fig. 1.
1992 *Tellina (Cadella) semen* - Lamprell & Whitehead, n. 317, pl. 44, fig. 317.
1995 *Cadella semen* - Bosch, Dance, Moolenbeek & Oliver, p. 253, fig. 1126.

This is a rather variable species featured by 1) subelliptical to ovate-triangular shell attaining 12 mm in length, 2) posterior side usually short, truncated, 3) hinge with 2 cardinal teeth, 1 anterior and 1 posterior lateral tooth in each valve, 4) sculpture of fine, even commarginal cords alternately fading away at the posterior angulation or continuing over the posterior slope.

Distribution and Habitat. *Tellina semen* is distributed from South Africa to Japan and to Hawaii. According to Bernard et al. (1993), the species occurs intertidally and infralittorally, in mud

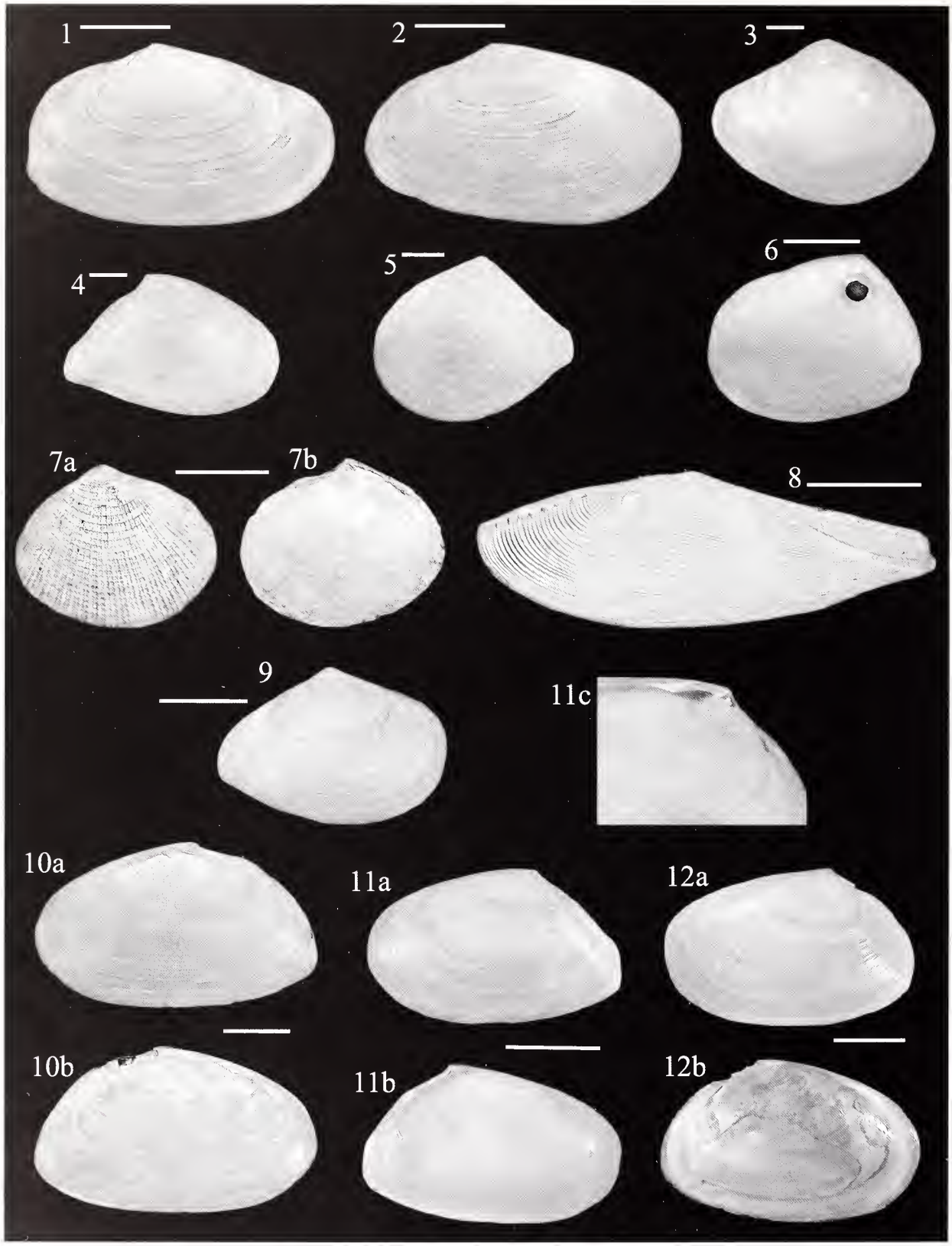

Plate 13: Fig. 1. *Tellina (Angulus) emarginata* (Sowerby, 1825), Senarivate, Quarry 1, level 6-7 m, Holocene; scale bar 10 mm. Fig. 2. *Tellina (Angulus) vestalis* Hanley, 1844, Ban Tak Daet, sample BTD4, Holocene; scale bar 10 mm. Fig. 3. *Arcopagia pudica* (Hanley, 1844), Station TH 55; scale bar 1 mm. Fig. 4. *Arcopagia yemenensis* (Melvill, 1898), Station TH 11; scale bar 1 mm. Fig. 5. *Tellina (Arcopella) casta* Hanley, 1844, Station TH 103; scale bar 2 mm. Fig. 6. *Tellina (Cadella) semen* Hanley, 1844, Station TH 40; scale bar 3 mm. Figs. 7a, 7b. *Tellina (Clathrotellina) carnicolor* Hanley, 1846, Station TH 108, scale bar 5 mm. Fig. 8. *Dallitellina spengleri* (Gmelin, 1791), Ban Tak Daet, sample BTD4, Holocene; scale bar 20 mm. Fig. 9. *Tellina (Macomona) australis* Deshayes, 1854, Locality TH 42A, Holocene; scale bar 5 mm. Figs. 10a, 10b. *Tellina (Moerella) nitens* Deshayes, 1854, Station TH 117; scale bar 5 mm. Figs. 11a, 11b, 11c. *Tellina (Moerella) pallidula* Lischke, 1871, Station TH 12; scale bar 5 mm. Figs. 12a, 12b. *Tellina (Moerella) valtonis* Hanley, 1844, Station TH 54, scale bar 5 mm.

and sand. Previous records in the Gulf of Thailand were from gravel and shell bottoms 9-18 m deep (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Tellina (Clathrotellina) carnicolor Hanley, 1846
Pl. 13, fig. 7

1844b *Tellina incarnata* Hanley, p. 68.
1909 *Tellina (Arcopagia) carnicolor* - Lynge, p. 190.
1932 *Tellina (Pseudarcopagia) carnicolor* - Prashad, p. 190.
1965 *Clathrotellina carnicolor* - Kira, p. 171, pl. 60, fig. 15.
1977 *Clathrotellina carnicolor* - Habe, p. 197, pl. 38, figs. 7, 8.
1992 *Tellina (Clathrotellina) carnicolor* - Lamprell & Whitehead, n. 326, pl. 45, fig. 326.

Tellina carnicolor is readily distinguished on account of 1) ovate shell hardly exceeding 15 mm in lenght, 2) hinge with 2 cardinal and 2 strong lateral teeths and 3) sculpture of fine lamellar radial and commarginal ribs giving a dense reticulated pattern with low spiny granules at the crossings. The sculpture is the most distinctive feature. *Tellina strangei* Deshayes, 1854 is currently regarded as a synonym.
DISTRIBUTION AND HABITAT. *Tellina carnicolor* is distributed from the Maldive Islands to Indonesia, New Caledonia and northward to Japan. It occurs uncommonly in mud and sand in the intertidal and infralittoral zones (KIRA, 1965; BERNARD et al., 1993). Former records in the Gulf of Thailand were from muddy or gravelly bottoms 9-27 m deep (LYNGE, 1909).
FOSSIL RECORDS: none recorded.

Tellina (Macomona) australis Deshayes, 1854
Pl. 13, fig. 9

1854b *Tellina australis* Deshayes, p. 362.
1992 *Tellina (Macomona) australis* - Lamprell & Whitehead, n. 329, pl. 45, fig. 329.
1996 *Tellina australis* - Jansen, p. 45, fig. 181.

The present species is featured by 1) ovate-triangular, inequilateral shell up to 25 mm in length, 2) anterior side broadly rounded, 3) posterior side triangular, subrostrate, slightly flexed to the right, 4) hinge with 2 cardinal teeth in each valve, 1 approximate right anterior lateral and 1 small right posterior lateral, 5) pallial sinus deep, with roundly angular upper border, confluent, touching the ventral side of the anterior adductor scar, 6) inner side with 2 weak, sometimes obsolescent posterior radial ribs, 7) outer surface with fine, even commarginal incised lines and microscopic radial striation. *Tellina philippinarum* Hanley, 1844 appears to be exceedingly similar except for a slightly less pointed hinder part.
DISTRIBUTION AND HABITAT. *Tellina australis* was so far known from Australian waters. It is reported to dwell in littoral sand (LAMPRELL & WHITEHEAD, 1992).
FOSSIL RECORDS: Holocene of Thailand.

Tellina (Moerella) nitens Deshayes, 1854
Pl. 13, fig. 10

1854b *Tellina nitens* Deshayes, p. 358.
1906 *Tellina (Angulus) nitens* - Melvill & Standen, p.822.
1954 *Fabulina nitidula* - Taki & Oyama, pl. 8, fig. 15; pl. 28, fig. 11.
1961 *Fabulina nitidula* - Hayasaka, p. 60, pl. 7, fig. 9.
1965 *Nitidotellina nitidula* - Kira, p. 173, pl. 61, fig. 7.
1968 *Nitidotellina nitidula hokkaidensis* - Habe, p. 201, pl. 62, fig. 6.
1971 *Nitidotellina nitidula* - Kuroda, Habe & Oyama, p. 453, pl. 99, fig. 13.
1977 *Nitidotellina nitidula* - Habe, p. 206, pl. 41, figs. 4, 5.
1983 *Nitidotellina nitidula* - Masuda, Hayasaka & Noda, p. 17, pl. 3, figs. 13, 14.
1984 *Tellina (Nitidotellina) nitidula* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 2, fig. 3.
1993 *Nitidotellina nitidula* - Noda, Kikuchi & Nikaido, p. 155, figs. 20(4, 5).
1995 *Tellina nitens* - Bosch, Dance, Moolenbeek & Oliver, p. 252, fig. 1120.

Tellina nitens is featured by 1) very thin, translucent shell attaining 25 mm in length, 2) elongate-oval outline, 3) obliquely subtruncate posterior end and 4) pallial sinus confluent, touching anterior adductor scar. The species was often mistaken for *Nitidotellina nitidula* (Dunker, 1860) which is markedly different (cf. JANSSEN, 1993 for the illustration of the holotype of Dunker's taxon).
DISTRIBUTION AND HABITAT. *Tellina nitens* ranges from the Persian Gulf to Southeast Asian waters and northward to Japan. It occurs in fine sandy and muddy bottoms, from low water mark down to 50 m depth.
FOSSIL RECORDS: Pliocene of Japan; Quaternary of Japan; Holocene of Thailand.

Tellina (Moerella) pallidula Lischke, 1871
Pl. 13, fig. 11

1965 *Fabulina pallidula* - Kira, p. 173, pl. 61, fig. 8.
1971 *Nitidotellina pallidula* - Kuroda, Habe & Oyama, p. 453, pl. 99, fig. 16.
1994 *Tellina pallidula* - Scott, p. 88, pl. 12, fig. B; text-fig. 1B.

Tellina pallidula is featured by 1) ovate, inequilateral, rather thin shell attaining 15 mm in length, 2) anterior side elongate, slightly attenuated, with rounded end, 3) posterior side triangular, truncated, 4) blunt posterior angulation, 5) postero-dorsal margin triflingly convex, rather steep, 6) hinge with 2 cardinal teeth in each valve, 2 approximate right lateral teeth and 1 stout posterior left lateral tooth, 7) pallial sinus very deep, almost touching the anterior adductor scar, its upper border subangular behind beaks, 8) outer surface with fine, uneven commarginal low cords.
DISTRIBUTION AND HABITAT. The species is known to range from the Philippines to Japan. According to BERNARD et al. (1993), it dwells in fine sandy and muddy substrates 10-80 m deep.
FOSSIL RECORDS: Holocene of Thailand.

Tellina (Moerella) valtonis Hanley, 1844
Pl. 13, fig. 12

1844b *Tellina valtonis* Hanley, p. 143.
? 1885 *Tellina (Angulus) valtonis* - Smith, p. 102.
1977 *Angulus valtonis* - Barash & Danin, p. 101, fig. 14.
1983 *Moerella jedoensis* - Masuda, Hayasaka & Noda, p. 16, pl. 3, fig. 11 (not fig. 12).
1992 *Tellina (Tellinides) valtonis* - Lamprell & Whitehead, n. 308, pl. 44, fig. 308.
Not 1992 *Tellina valtonis* - Oliver, p. 156, pl. 35, fig. 7.
1992 *Tellina vernalis* - Oliver, p. 157, pl. 35, fig. 8.
1992 *Angulus valtonis* - Barash & Danin, p. 288, fig. 320.
Not 1995 *Tellina valtonis* - Bosch, Dance, Moolenbeek & Oliver, p. 252, fig. 1122.
1995 *Tellina vernalis* - Bosch, Dance, Moolenbeek & Oliver, p. 252, fig. 1123.
1995 *Tellina valtonis* - Scott, p. 43, fig. in same page, middle right.

Tellina valtonis is featured by 1) oblong-ovate, moderately inequilateral, thin shell attaining 18 mm in length, 2) anterior side oval, slightly attenuated, 3) postero-dorsal and posterior margins forming an obtuse angle, 4) hinge with 2 cardinal teeth in each valve and 1 approximate right anterior lateral tooth, 5) pallial sinus deep, not touching the anterior adductor scar, with upper border roundly angled below beak, 6) outer surface with fine commarginal lines. The identification is based on the figure published by LAM-

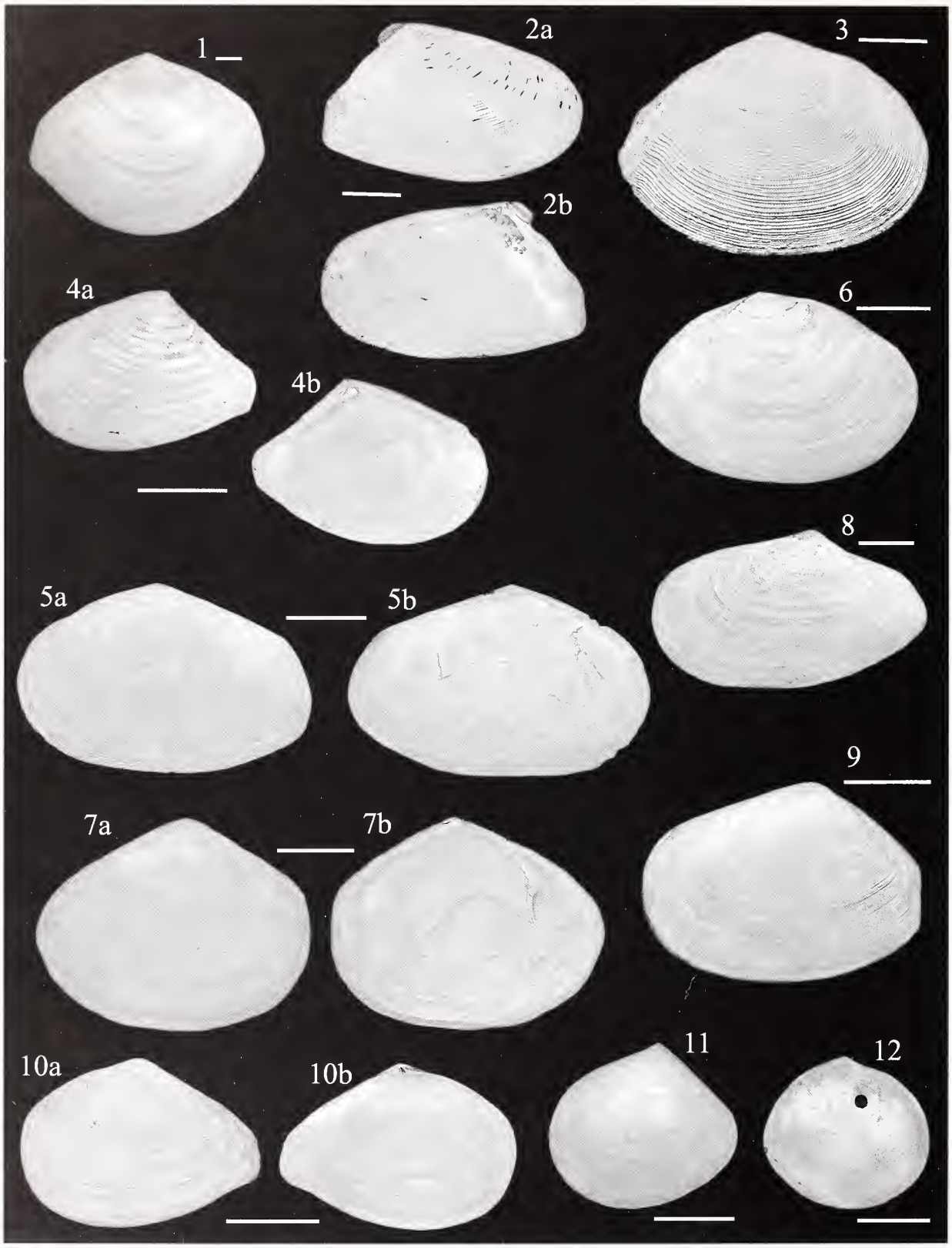

Plate 14: Fig. 1. *Tellina (Pinguitellina) pinguis* Hanley, 1844, Station TH 98; scale bar 1 mm. Figs. 2a, 2b. *Tellina (Semelangulus)* sp., Station TH 34; scale bar 2 mm. Fig. 3. *Tellina (Serratina) capsoides* Lamarck, 1818, Station TH 11; scale bar 10 mm. Figs. 4a, 4b. *Tellina (Tellinangulus) aethiopica* Thiele & Jaeckel, 1931, Station TH 108; scale bar 2 mm. Figs. 5a, 5b. *Tellina (Tellinides) timorensis* Lamarck, 1818, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 6. *Tellina (Tellinides) vernalis* Hanley, 1844, Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 5 mm. Figs. 7a, 7b. *Tellina (Tellinides)* sp., Station TH 6; scale bar 10 mm. Fig. 8. *Exotica (Exotica)* sp., Station TH 27; scale bar 3 mm. Fig. 9. *Macoma (Psammacoma) fallax* Bertin, 1878, Station TH 6; scale bar 10 mm. Figs. 10a, 10b. *Macoma (Pinguimacoma) cygnus* (Hanley, 1844), Station TH 75; scale bar 5 mm. Fig. 11. *Macoma (Pinguimacoma) languida* (Smith, 1885), Station TH 53; scale bar 5 mm. Fig. 12. *Macoma (Pinguimacoma)* sp., Ban Ko, sample NC1, Holocene; scale bar 5 mm.

PRELL & WHITEHEAD (1992) that fits in with the original description.

DISTRIBUTION AND HABITAT. The species is distributed in the Indo-Pacific, from the Red Sea to Australia and northward to Japan. *Tellina valtonis* has recently entered the Mediterranean Sea via Suez canal (BARASH & DANIN, 1977, 1992). In the Persian Gulf it is reported to occur infralittorally in muddy shell gravels (BOSCH et al., 1995, sub *Tellina vernalis*). Up-to-date records in the Gulf of Thailand were from fine sediments 60-70 m deep (SCOTT, 1995).

FOSSIL RECORDS: Holocene of Thailand.

Tellina (Pinguitellina) pinguis Hanley, 1844

Pl. 14, fig. 1

1844b *Tellina pinguis* Hanley, p. 63.
1909 *Tellina (Arcopagia) pinguis* - Lynge, p. 191.
1918 *Tellina (Arcopagia) pinguis* - Lamy, p. 122.
1964 *Pinguitellina pinguis* - Spry, p. 37.
1965 *Pinguitellina pinguis* - Kira, p. 173, pl. 61, fig. 1.
1977 *Pinguitellina pinguis* - Habe, p. 203, pl. 40, figs. 9-11.
1992 *Tellina (Pinguitellina) pinguis* - Oliver, p. 151, pl. 30, fig. 3.
1992 *Tellina (Pinguitellina) pinguis* - Lamprell & Whitehead, n. 321, pl. 45, fig. 321.
1995 *Pinguitellina pinguis* - Bosch, Dance, Moolenbeek & Oliver, p. 256, fig. 1143.
1995 *Pinguitellina pinguis* - Kubo & Kurozumi, p. 191, fig. 3.

The species is featured by 1) trigonal-ovate, rather tumid, slightly inequilateral shell attaining 15 mm in length, 2) antero-dorsal and postero-dorsal margins equally sloping, 3) ventral margin prominently arched, 4) distinct postero-ventral angle, 5) hinge with 2 cardinal teeth, 1 anterior and 1 posterior lateral tooth in each valve, the left laterals weaker, 6) pallial sinus moderately deep, extending just to the end of the anterior lateral tooth, 7) outer surface shining, with exceedingly fine commarginal striation.

DISTRIBUTION AND HABITAT. *Tellina pinguis* ranges from the Red Sea to Torres Strait and further eastward to Pacific Islands, northward to Japan. The species is rather common in sand and mud from the intertidal zone down to 30 m depth (BERNARD et al., 1993; KUBO & KUROZUMI, 1995). In the Gulf of Thailand it has been recovered from gravelly and sandy substrates 1-18 m deep (LYNGE, 1909). Information in the literature suggests that *Tellina pinguis* is a tolerant sand-related element.

FOSSIL RECORDS: Quaternary of Japan; Holocene of Thailand.

Tellina (Semelangulus) sp.

Pl. 14, fig. 2

The present unidentified species is featured by 1) oblong-ovate, markedly inequilateral shell attaining 8 mm in length, 2) anterior side elongate, with rounded end, 3) posterior side about one half the length of the anterior one, wedge-shaped, 4) blunt posterior ridge followed by 2 sharper ridges over the postero-dorsal area, 5) hinge with 2 cardinal teeth in each valve and 2 distant, long right laterals, respectively anterior and posterior, 6) sculpture of low commarginal cords partly fading away over the posterior ridge, partly changing into raised lamellae over the postero-dorsal area. *Tellina miyatensis* Yokoyama, 1920 is closely related but has longer posterior side and finer sculpture.

Tellina (Serratina) capsoides Lamarck, 1818

Pl. 14, fig. 3

1871 *Tellina capsoides* - Römer, p. 48, pl. 14, figs. 1-3.
1871 *Tellina perplexa* - Römer, p. 49, pl. 14, figs. 4-6.
1909 *Tellina (Arcopagia) capsoides* - Lynge, p. 189.
1909 *Tellina (Arcopagia) siamensis* - Lynge, p. 189.
1918 *Tellina (Pristis) pristis* - Lamy, p. 29.
1932 *Tellina (Arcopagia) capsoides* - Prashad, p. 186.
1960 *Tellina pristis* - Paes da Franca, p. 100, pl. 29, fig. 3.
1969 *Quadrans (Pistris) pristis* - Afshar, p. 41, pl. 12, figs. 1-5.
1969 *Tellina (Serratina) capsoides* - Boss, p. 113, pl. 6, fig. 4; pl. 8, figs. 5, 6; pl. 14, fig. 3.
1977 *Merisca (Pistris) capsoides* - Habe, p. 198, pl. 38, figs. 10, 11.
1979 *Tellina (Serratina) capsoides* - Tantanasiriwong, p. 15.
1981 *Tellina capsoides* - Richards, p. 88, pl. 57, fig. 503.
1982 *Tellina capsoides* - Abbott & Dance, p. 342, fig. in upper mid row, right.
1992 *Tellina (Serratina) capsoides* - Oliver, p. 149, pl. 33, fig. 10.
1992 *Tellina (Pistris) capsoides* - Lamprell & Whitehead, n. 338, pl. 46, fig. 338.
1995 *Serratina capsoides* - Bosch, Dance, Moolenbeek & Oliver, p. 255, fig. 1138.
1996 *Tellina capsoides* - Jansen, p. 45, fig. 182.
1997 *Tellina (Serratina) capsoides* - Yamashita, Okamoto, Harato & Fukuda, p. 104, figs. 1-29.

Tellina capsoides is a variable species attaining 60 mm in length. It is readily distinguished by 1) strong lateral teeth in the right valve, 2) ventral digitiform extension of the posterior adductor scar, 3) dense, regular concentric threads and 4) weak radial sculpture.

DISTRIBUTION AND HABITAT. *Tellina capsoides* is widely distributed in the Indo-Pacific, ranging from South Africa to Queensland and Fiji, and northward to Japan. According to BERNARD et al. (1993), *Tellina capsoides* occurs in sand and mud between 10 and 60 m depth. Boss (1969) reported that the species prefers soft sandy or muddy substrates in the intertidal zone. YAMASHITA et al. (1997) recorded *Tellina capsoides* throughout the Japanese Archipelago, in muddy bottoms in the innermost parts of large enbayments. In Thai waters, it was recorded from muddy sand flats seaward of the mangrove forest (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Holocene of Thailand.

Tellina (Tellinangulus) aethiopica Thiele & Jaeckel, 1931

Pl. 14, fig. 4

1969 *Angulus (Tellinangulus) aethiopicus* - Afshar, p. 73, pl. 28, fig. 1.
1969 *Tellina (Tellinangulus) aethiopicus* - Treatise l. P., p. N620, fig. E 108 (1).

The Thai specimens perfectly conform to the original figure reproduced by Afshar (1969). The species is featured by 1) trigonal-ovate, somewhat rostrate shell up to 8 mm in lenght, 2) hinge with the right anterior lateral short, close to the anterior cardinal and 3) sculpture of commarginal lamellae, some vanishing on the posterior part, and of fine radial threads. There seems to be no related species in the Indo-Pacific.

DISTRIBUTION AND HABITAT. *Tellina aethiopica* was originally described from East African waters. There is no information on its ecological requirements.

FOSSIL RECORDS: Holocene of Thailand.

Tellina (Tellinides) timorensis Lamarck, 1818

Pl. 14, fig. 5

1846 *Tellina (Tellinides) timorensis* - Philippi, p. 90. Pl. 4, fig. 3.
1869 *Tellina (Tellinides) timorensis* - Issel, p. 61.
1871 *Tellina timorensis* - Römer, p. 166, pl. 34, figs. 4-6.
1920 *Tellina timorensis* - Tesch, p. 105, pl. 140, fig. 278.
1960 *Tellina timorensis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 204, fig. 169.
1965 *Tellinides timorensis* - Kira, p. 174, pl. 61, fig. 18.
1969 *Tellina (Tellinides) timorensis* - Treatise l. P. , p. N621, fig. E108 (9).

1969 *Tellina (Tellinides) timorensis* - Afshar, p. 28, pl. 4, figs. 5-9.
1978 *Tellinides timorensis* - Kirtisinghe, p. 39, pl. 20, fig. 3.
1992 *Tellina timorensis* - Dharma, p. 92, pl. 24, fig. 7.
1995 *Tellina timorensis* - Kubo & Kurozumi, p. 193, fig. 2.

Tellina timorensis is recognized by 1) elongate-subquadrangular, compressed, inequilateral shell up to 50 mm in length, 2) anterior side attenuated, with rounded end, 3) posterior side somewhat longer, attenuated and obliquely truncated, 4) antero-dorsal and postero-dorsal margins straight and equally sloping, 5) hinge with 2 cardinal teeth in each valve, 1 right anterior lateral close to cardinals, 1 right posterior lateral distant and obsolescent, 6) pallial sinus deep, moderately wide, confluent, ending some distance from the anterior adductor scar, with angular upper border, 7) outer surface with uneven growth markings.

DISTRIBUTION AND HABITAT. The species ranges from the Red Sea to Indonesia and northward to Japan. It occurs intertidally and down to 25 m in sand (BERNARD et al., 1993).

FOSSIL RECORDS: Upper Miocene of Indonesia, Philippines and Japan; Pliocene and Quaternary of Indonesia; Holocene of Thailand.

Tellina (Tellinides) vernalis Hanley, 1844

Pl. 14, fig. 6

1844b *Tellina vernalis* Hanley, p. 141.
1885 *Tellina (Angulus) vernalis* - Smith, p. 103.
1992 *Tellina (Tellinides?) vernalis* - Lamprell & Whitehead, n. 310, pl. 44, fig. 310.

The species is characterized by 1) elongate-oval, subequilateral shell attaining 24 mm in length, 2) posterior side slightly more tapering than the anterior one, 3) weak but distinct posterior ridge, 4) hinge with 2 cardinal teeth in each valve and 1 stout, triangular right anterior lateral adjacent to cardinals, 5) pallial sinus wide and deep, nearly touching the anterior adductor scar, with broadly arched upper border, 6) outer surface with fine, uneven growth lines. The Bangkok Clay specimens conform to the shell figured by LAMPRELL & WHITEHEAD (1992) except for being somewhat less inequilateral.

DISTRIBUTION AND HABITAT. *Tellina vernalis* ranges from Australia to Indonesia and peninsular Malaysia. Occurrences were from muddy or sandy substrates in the upper infralittoral zone.

FOSSIL RECORDS: Holocene of Thailand.

Tellina (Tellinides) sp.

Pl. 14, fig. 7

This unidentified species is featured by 1) ovate-triangular, subequilateral, rath er compressed shell up to 50 mm in length, 2) anterior side obtusely rounded, 3) posterior side slightly longer, attenuated, narrowly rounded, 4) antero-dorsal and postero-dorsal margins triflingly arched, rather sloping, 5) hinge with 2 cardinal teeth in each valve, 1 right spiny anterior lateral close to cardinals, right posterior lateral obsolete, 6) pallial sinus deep, confluent, with roundly angular upper border, ending in a moderately sharp point some distance from the anterior adductor scar, 7) outer surface with coarse commarginal growth markings. The present form differs from *Tellina timorensis* Lamarck, 1818 in that has higher shell and lacks the posterior truncation.

Arcopagia pudica (Hanley, 1844)

Pl. 13, fig. 3

1844b *Tellina pudica* Hanley, p. 62.
1909 *Tellina (Arcopagia?) pudica* - Lynge, p. 194, pl. 3, figs. 35-37.
1932 *Tellina (Arcopagia) pudica* - Prashad, p. 184.
1971 *Tellina (Punipagia) pudica* - Shuto, p. 40, pl. 5, figs. 7, 10, 11, 13; text fig. 8 (9-11).

The species is characterized by 1) oval, inequilateral, moderately inflated shell attaining 10 mm in length, 2) rounded anterior side, 3) triangular, shortly truncated posterior part, slightly longer than the anterior one, 4) hinge with 2 cardinal teeth in each valve, 1 anterior and 1 posterior right lateral teeth, 5) pallial sinus deep, confluent, not reaching the anterior adductor scar, 6) outer surface with fine growth lines.

DISTRIBUTION AND HABITAT. *Arcopagia pudica* is distributed from Southeast Asia to Japan. According to BERNARD et al. (1993), it occurs intertidally and down to 40 m depth, in mud and sand. It was recovered in the mangrove forest on the west coast of Malaya (PURCHON & PURCHON, 1981; MORRIS & PURCHON, 1981); in the Gulf of Thailand, was noted to occur abundantly in muddy bottoms of the infralittoral zone (LYNGE, 1909).

FOSSIL RECORDS: Pliocene of Indonesia; Quaternary of the southwest Pacific area; Holocene of Thailand.

Arcopagia yemenensis (Melvill, 1898)

Pl. 13, fig. 4

1969 *Tellina (Arcopagia) yemenensis* - Boss, p. 106, pl. 7, figs. 3, 4; pl. 17, figs. 5, 6.
1992 *Tellina bertini* - Oliver, p. 155, pl. 35, fig. 11.

The species is featured by 1) trigonal, inequilateral, inflated shell attaining 18 mm in length, 2) anterior side elliptical, 3) posterior side triangular, flexed to right, 4) hinge with 2 cardinal teeth, 1 anterior and 1 posterior lateral tooth in each valve, the right anterior lateral strong and proximal, 5) pallial sinus very deep, almost touching the anterior adductor scar, its upper border with greatest convexity just behind the beaks, 6) sculpture of even, closely set commarginal fine cords.

DISTRIBUTION AND HABITAT. *Arcopagia yemenensis* was so far known from the Indian Ocean, being recorded from South Africa to the Red Sea. There is no information about its ecological requirements.

FOSSIL RECORDS: Holocene of Thailand.

Dallitellina spengleri (Gmelin, 1791)

Pl. 13, fig. 8

1871 *Tellina rostrata* - Römer, p. 33, pl. 3, figs. 5-7; pl. 11, figs. 4, 5.
1909 *Tellina (Tellinella) spengleri* - Lynge, p. 187.
1923a *Tellina rostrata* - Van der Meer Mohr, p. 122, pl. 1, figs.1-3.
1923b *Tellina rostrata* - Van der Meer Mohr, p. 211, pl. 9, figs. 3, 4.
1932 *Tellina (Tellina) deshayesii* - Prashad, p. 182, pl. 5, fig. 33.
1965 *Tellinella spengleri* - Kira, p. 174, pl. 61, fig. 17.
1969 *Tellina (Dallitellina) rostrata* - Afshar, p. 38, pl. 10, figs. 5-9.
1982 *Tellina spengleri* - Abbott & Dance, p. 340, fig. in bottom row, right.
1992 *Tellina spengleri* - Dharma, p. 92, pl. 24, fig. 8.
1992 *Tellina (Pharaonella) rostrata* - Oliver, p. 153, pl. 34, fig. 9; text-fig. 57.

This is a distinctive species readily recognized by 1) markedly elongate, subequilateral, inequivalve, flexed to the right and rostrate shell attaining 80 mm in length, 2) hinge with 2 cardinal teeth in each valve, 1 anterior and 1 posterior right lateral tooth, 3) pallial sinus roundly quadrangular, with free anterior part, extending to the level of beaks, 4) sculpture of 2 dorsal rows of small spines, respectively anterior and posterior, and of slightly oblique commarginal fine cords. The present species has been often mistaken for *Dallitellina rostrata* (Linnaeus, 1758). This latter is similarly shaped, but lacks the dorsal rows of spines and bears commarginal lines only.

DISTRIBUTION AND HABITAT. The species ranges in the Indian Ocean and the Southwest Pacific, from the Red Sea to Indonesia and northward to China Sea. According to BERNARD et al. (1993) it occurs intertidally and down to 20 m depth, in sand. *Dallitellina spengleri* was recorded from intertidal sands in Malayan and Singapore waters (PURCHON & PURCHON, 1981; MORRIS & PURCHON, 1981).
FOSSIL RECORDS: Pliocene of Indonesia; Holocene of Thailand.

Subfamily *Macominae*

Macoma (Pingnimacoma) cygnus (Hanley, 1844)
Pl. 14, fig. 10

1844b *Tellina cygnus* Hanley, p. 144.
1885 *Tellina (Homala) cygnus* - Martin, p. 203, pl. 10, fig. 204.
1909 *Tellina (Peronaea) cygnus* - Lynge, p. 204.
1932 *Tellina (Peronidia) cygnus* - Prashad, p. 196.
1994 *Tellina cygnus* - Scott, p. 86, pl. 12, fig. A (*syntype*); text-fig- 1A.

The species is featured by 1) ovate-oblong, slightly inequilateral, moderately convex shell up to 18 mm in length, 2) anterior side broadly round, 3) posterior side roundly triangular, subrostrate, 4) blunt posterior ridge preceded by a shallow radial depression, this latter resulting in a distinct sinuation of the postero-ventral margin, 5) hinge with 2 cardinals in each valve, the left posterior one very small, laminar and adjacent to the ligamental groove, 6) outer surface with rather even commarginal lines. The absence of lateral teeth points toward the placement of the present species within the macomine.
DISTRIBUTION AND HABITAT. *Macoma cygnus* is distributed from New Caledonia to Indonesia and northward to China Sea. The original material was recovered from coral sand at a depth of 12 m; Macassar records were from the 27-32 bathymetric interval (PRASHAD, 1932); Hong Kong records were from silty and sandy substrates (SCOTT, 1994). Previous records in the Gulf of Thailand refer to infralittoral muddy substrates (LYNGE, 1909).
FOSSIL RECORDS: Pliocene of Indonesia; Quaternary of the southwest Pacific area; Holocene of Thailand.

Macoma (Pingnimacoma) languida (Smith, 1885)
Pl. 14, fig. 11

1885 *Tellina (?) languida* Smith, p. 110, pl. 4, fig. 8.
1909 *Tellina (Arcopagia ?) languida* - Lynge, p. 194.
1992 *Tellina (Pinguitellina) languida* - Lamprell & Whitehead, n. 323, pl. 45, fig. 323.

Macoma languida is featured by 1) ovate-triangular, high, inequilateral and rather tumid shell attaining 15 mm in length, 2) anterior side broadly oval, 3) posterior side slightly shorter, triangular and with obtuse end, 4) inner antero-dorsal and postero-dorsal groove parallel to the margin in the right valve, 5) ventral margin prominently arched, 6) hinge with 2 cardinal teeth in each valve, 7) pallial sinus deep and wide, half-confluent, ending some distance from the anterior adductor scar, 8) outer surface with fine growth lines. The lack of clearly developed lateral teeth favours the allocation of the present species in the subfamily Macominae.
DISTRIBUTION AND HABITAT. The species ranges from Australia to the Gulf of Thailand. The original material was recovered at depths of from 5 to 20 m. Previous records in the Gulf of Thailand were from infralittoral muddy substrates (LYNGE, 1909).
FOSSIL RECORDS: Quaternary of Indonesia; Holocene of Thailand.

Macoma (Pingnimacoma) sp.
Pl. 14, fig. 12

A single, 9.5 mm long, right valve is in hand, featured by 1) subequilateral, subcircular in outline, 2) anterior and posterior sides rounded, the latter slightly shorter, 3) inner antero-dorsal and postero-dorsal oblique grooves cutting the margins, 4) hinge with 2 cardinal teeth, 5) pallial sinus partly obscured, distinctly separated from the pallial line in its anterior part at least, 6) outer surface with very fine commarginal lines. The present unidentified species differs from the preceding one in being as high as long and roundly shaped.
FOSSIL RECORDS: Holocene of Thailand.

Macoma (Psammacoma) fallax Bertin, 1878
Pl. 14, fig. 9

1872 *Tellina (Macoma) candida* - Römer, p. 251, pl. 47, figs. 10-12.
1909 *Tellina (Macoma) fallax* - Lynge, p. 207.
1932 *Macoma (Psammacoma) fallax* - Prashad, p. 197.

Macoma fallax is characterized by 1) ovate, moderately tumid, slightly flexed to the right and inequilateral shell attaining 50 mm in length, 2) anterior side oval, slightly attenuated, 3) posterior side more sharply attenuated, subtruncate, slightly gaping 3) ventral margin broadly arched, 4) hinge with 2 cardinal teeth in each valve, the right ones both grooved, stronger, 5) pallial sinus deep, confluent, with angular upper border, touching the anterior adductor scar in the right valve, nearly so in the left one, 6) outer surface with coarse growth markings and finer commarginal lines in between. The species was often mistaken for *Macoma candida* (Lamarck, 1818).
DISTRIBUTION AND HABITAT. The species ranges from Indonesia to China Sea. According to BERNARD et al. (1993), it occurs intertidally and down to 10 m depth, in mud and sand. Previous records in the Gulf of Thailand were from muddy substrates, in the 5-10 m bathymetric interval (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Exotica (Exotica) sp.
Pl. 14, fig. 8

A single left valve 13 mm long is in hand, featured by 1) elliptical-oblong, moderately inflated, inequilateral shell with subparallel antero-dorsal and ventral margins, 2) anterior side elliptical, with rounded end, 3) posterior side triangular, nearly as long as the anterior one, 4) postero-dorsal margin gently concave, forming an obtuse angle with the short, oblique posterior truncation, 5) hinge with 2 cardinal teeth, the anterior one grooved, the posterior very small, lamellar, 6) pallial sinus deep, separated from the anterior adductor scar by a distance somewhat greater than the breadth of this latter, 7) outer surface with commarginal lines, slightly more raised over the postero-dorsal area. The present specimen strongly resembles *Exotica (Loxoglypta) rhomboides* (Quoy & Gaimard, 1834) in all respectes but lacks the scissulate sculpture of that species.

Psammotreta (Psendometis) praerupta (Salisbury, 1934)
Pl. 15, fig. 1

1872 *Tellina (Macoma) gubernaculum* - Römer, p. 247, pl. 47, figs. 1-3.
1872 *Tellina (Macoma) truncata* - Römer, p. 248, pl. 47, figs. 4-6.
1909 *Tellina (Macoma) papyracea* - Lynge, p. 206, pl. 3, figs. 50-52.
1960 *Macoma truncata* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang

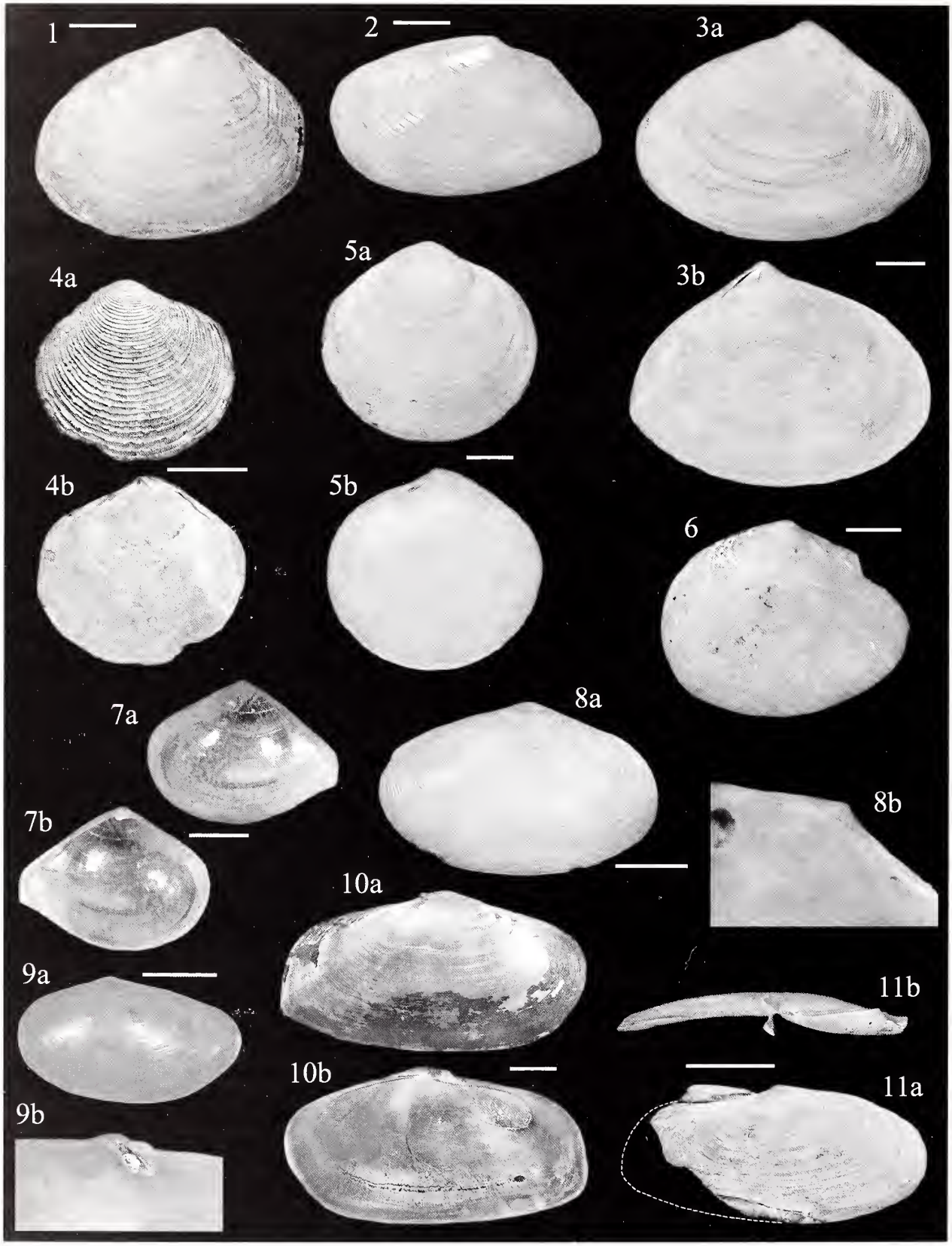

Plate 15: Fig. 1. *Psammotreta (Pseudometis) praerupta* (Salisbury, 1934), Station TH 55; scale bar 10 mm. Fig. 2. *Pulvinus micans* (Hanley, 1844), Station TH 53, scale bar 5 mm. Figs. 3a, 3b. *Psammotreta (Tellinimactra) edentula* (Spengler, 1798), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 4a, 4b. *Semele carnicolor* (Hanley, 1847), Station TH 108; scale bar 10 mm. Figs. 5a, 5b. *Semele sinensis* Adams, 1853, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 6. *Iacra* sp., Station TH 42; scale bar 1 mm. Figs. 7a, 7b. *Leptomya* sp., Station TH 108; scale bar 1 mm. Figs. 8a, 8b. *Gari (Gari) simplex* (Sowerby, 1894), Station TH 12; scale bar 5 mm. Figs. 9a, 9b. *Theora (Theora) lata* (Hinds, 1843), Station TH 14; scale bar 5 mm. Figs. 10a, 10b. *Gari (Psammotaena) elongata* (Lamarck, 1818), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 11a, 11b. *Soletellina diphos* (Linnaeus, 1771), Ban Tak Daet, sample BTD 2, Holocene; scale bar 10 mm.

Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 210, fig. 175.
1961 *Pseudometis praerupta* - Hayasaka, p. 59, pl. 7, fig. 6.
1968 *Psammotreta (Pseudometis) papyracea keenae* - Habe, p. 202, pl. 62, fig. 15.
1969 *Macoma (Pseudometis) praerupta* - Afshar, p. 81, pl. 33, figs. 6-10.
1969 *Psammotreta (Pseudometis) praerupta* - Treatise I. P., p. 627, fig. E112 (3).
1977 *Psammotreta (Pseudometis) praerupta* - Habe, p. 212, pl. 43, figs. 8, 9,
1984 *Psammotreta (Pseudometis) praerupta* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 2, figs. 5, 6.
1986 *Psammotreta (Pseudometis) praerupta* - Sato, Masuda & Shuto, p. 33, pl. 4, fig. 8.
1992 *Psammotreta (Pseudometis) praerupta* - Oliver, p. 157, pl. 37, fig. 4.
1992 *Macoma (Psammacoma) candida* - Lamprell & Whitehead, n. 362, pl. 49, fig. 362.
1995 *Psammotreta praerupta* - Bosch, Dance, Moolenbeek & Oliver, p. 257, fig. 1147.

Distinctive features are 1) ovate to ovate-triangular, markedly inequilateral shell attaining 50 mm in length, 2) beaks at the posterior one-fourth, 3) anterior side oval, somewhat attenuated, 4) posterior side very short, 5) postero-dorsal margin very steep, forming an obtuse angle with the posterior margin, 6) hinge with 2 small cardinal teeth in each valve, 7) pallial sinus subquadrate, half-confluent, extending slightly beyond mid-length, 8) outer surface with uneven growth lines, more evident over the posterior area. *Tellina gubernaculum* Hanley, 1844 and *Tellina truncata* Jonas in Philippi, 1844 are synonyms (cf. Lynge, 1909; Afshar, 1969; Oliver, 1992; Bernard et al., 1993). *Psammotreta arafurensis* (Smith, 1885) is closely related but has more elongate, oval shell.

Distribution and Habitat. The species ranges from East Africa and the Red Sea to Australia and northward to Japan. *Psammotreta praerupta* is reported to dwell in fine sandy and muddy substrates from the intertidal zone to 50 m depth (Habe, 1968; Bernard et al., 1993). In the Gulf of Thailand it was recovered from muddy bottoms 5-15 m deep (Lynge, 1909).

Fossil records: Pliocene and Quaternary of Japan; Holocene of Thailand.

Psammotreta (Tellinimactra) edentula (Spengler, 1798)

Pl. 15, fig. 3

1872 *Tellina angulata* - Römer, p. 209, pl. 40, figs. 4-6.
1906 *Tellina lamyi* - Dautzenberg & Fischer, p. 224.
1918 *Tellina (Tellinimactra) edentula* - Lamy, p. 169.
1956 *Tellina angulata* - Satyamurti, p. 155, pl. 23, fig. 2.
1969 *Apolymetis (Tellinimactra) edentula* - Afshar, p. 92, pl. 39, figs. 6-8.
1969 *Psammotreta (Tellinimactra) edentula* - Treatise I.P., p. N 627, fig. E 112 (2).
1977 *Psammotreta (Tellinimactra) edentula* - Habe, p. 212, pl. 41, figs. 10-12.
1978 *Tellina angulata* - Kirtisinghe, p. 40, pl. 20, fig. 5.
1982 *Apolymetis angulata* - Bosch & Bosch, p. 179, upper mid fig.
1992 *Psammotreta (Tellinimactra) edentula* - Oliver, p. 157, pl. 37, fig. 1.
1992 *Psammotreta (Tellinimactra) edentula* - Lamprell & Whitehead, n. 375, pl. 50, fig. 375.
1995 *Tellinimactra angulata* - Bosch, Dance, Moolenbeek & Oliver, p. 257, fig. 1148.

Psammotreta edentula is readily recognized on the basis of 1) ovate-triangular, flexed to the right and markedly inequivalve shell up to 60 mm in length, 2) distinct posterior angulation, 3) hinge edentulous in mature specimens, 4) ligament fully internal, in moderately large, oblique, triangular resilifer, 5) pallial sinus deep and wide, with arched upper border, largely confluent, ending some distance from the anterior adductor scar, 6) outer surface with fine, uneven growth lines.

Distribution and Habitat. *Psammotreta edentula* is distributed from the Red Sea to Australia and northward to China Sea. According to Bernard et al. (1993), it dwells in mud and sand, intertidally and down to 10 m depth. Van Regteren Altena (1945) recovered the species from sandy beaches with mangroves in Java.

Fossil records: Holocene of Thailand.

Pulvinus micans (Hanley, 1844)

Pl. 15, fig. 2

1844b *Tellina micans* Hanley, p. 72.
1871 *Tellina micans* - Römer, p. 120, pl. 28, fig. 5-7.
1872 *Tellina depauperata* - Römer, p. 254, pl. 49, fig. 1-3.
1906 *Tellina (Peronea) micans* - Melvill & Standen, p. 823.
1909 *Tellina (Peronea) micans* - Lynge, p. 204.
1932 *Tellina (Peronidia) micans* - Prashad, p. 195.
1981 *Pulvinus micans* - Poutiers, p. 341.

Pulvinus micans is readily distinguished on the basis of 1) oval, rather flat and thin, inequilateral shell attaining 30 mm in length, 2) anterior side oval, 3) posterior side subtriangular, 4) hinge with 2 cardinal teeth in each valve, 5) pallial sinus deep, confluent, ending some distance from the anterior adductor scar, its upper border regularly arched, 6) outer surface with exceedingly fine growth lines and somewhat imbricate, oblique ribbons that fade away over the posterior part. The sculpture is the most distinctive feature. The absence of lateral teeth points toward the allocation of the present species in the subfamily Macominae.

Distribution and Habitat. The species is distributed in the Indo-Pacific, from the Gulf of Aden to Indonesia and northward to China Sea (Poutiers, 1981). According to Bernard et al. (1993), it occurs in mud in the 40-60 m bathymetric interval. Previous records in the Gulf of Thailand were from muddy substrates 5-36 m deep (Lynge, 1909).

Fossil records: none recorded.

Family *Semelidae*

Semele carnicolor (Hanley, 1847)

Pl. 15, fig. 4

1932 *Tellina (Pseudarcopagia) carnicolor* - Prashad, p. 190.
1954 *Semele carnicolor* - Taki & Oyama, pl. 39, fig. 17.
1965 *Semele carnicolor* - Kira, p. 169, pl. 59, fig. 17.
1976a *Semele carnicolor* - Nielsen, p. 6, fig. 70.
1991 *Semele jukesi* - Abbott, p. 100, pl. 43, fig. 5.
1992 *Semele carnicolor* - Oliver, p. 167, pl. 30, fig. 5.
1995 *Semele carnicolor* - Bosch, Dance, Moolenbeek & Oliver, p. 261, fig. 1169.
1995 *Semele carnicolor* - Kubo & Kurozumi, p. 194, bottom fig.; p. 195, fig. 9.

Semele carnicolor is characterized by 1) high, suborbicular shell up to 50 mm, 2) beaks slightly posterior to midline and 3) closely spaced, upturned concentric lamellae overridden by dense radial threads. The species is somewhat variable primarily in terms of valve outline. As already noted by Oliver (1992), several similarly sculptured Indo-Pacific species are likely to be junior synonyms of *Semele carnicolor*.

Distribution and Habitat. *Semele carnicolor* ranges in the Indo-Pacific, from the Red Sea to Indonesia and northward to Japan. It dwell in coarse sandy bottoms intertidally and down to 25 m depth (Bernard et al., 1993). Former records in Thai waters were from coarse beach sands (Nielsen, 1976).

Fossil records: Pliocene and Quaternary of Japan.

Semele sinensis Adams, 1853
Pl. 15, fig. 5

1853 *Semele sinensis* Adams, p. 95.
1960 *Semele sinensis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 198, fig. 164.
1992 *Semele sinensis* - Oliver, p. 167, pl. 30, fig. 4.
1992 *Semele sinensis* - Lamprell & Whitehead, n. 424, pl. 56, fig. 424.
1995 *Semele sinensis* - Bosch, Dance, Moolenbeek & Oliver, p. 261, fig. 1171.

The species attains 35 mm in length. It is distinguished on the basis of sculptural features that consist of low, closely set radial riblets crossed by commarginal lines. *Semele cordiformis* (Holten, 1803) has finer, more numerous radial riblets.
DISTRIBUTION AND HABITAT. *Semele sinensis* ranges from the Red Sea to Australia and northward to China Sea. It occurs subtidally to 20 m depth, in sand and mud (BERNARD et al., 1993). MORRIS & PURCHON (1981) recovered the species from intertidal sands and rocky shores on the west coast of Malaya.
FOSSIL RECORDS: Holocene of Thailand.

Iacra sp.
Pl. 15, fig. 6

The present unidentified species is featured by 1) oval, inequilateral shell attaining 7 mm in length, rounded anteriorly, attenuated posteriorly, 2) divaricate sculpture of distinct lines, commarginal over the anterior part, oblique in the middle, upturned posteriorly. *Iacra seychellarum* (Adams, 1856) and *Iacra japonica* (Adams, 1864) appear to be closely related species. The former has comparatively higher shell, the latter is less attenuated posteriorly and has denser oblique lines.
FOSSIL RECORDS: Holocene of Thailand.

Leptomya sp.
Pl. 15, fig. 7

The specimens in hand are featured by 1) ovate-triangular, rather inflated, smooth and glossy shell not exceeding 3.5 mm in lenght, 2) shortly rostrate posterior end, 3) small, oblique chondrophore and 4) distinct anterior and posterior lateral teeth in right valve. It is of note that LYNGE (1909, p. 215) recorded *Leptomya spectabilis* Hanley, 1844 in the Gulf of Thailand. However, the identity of the present material with the similarly sized specimens cited by this author cannot be stated.
FOSSIL RECORDS: Holocene of Thailand.

Theora (Theora) lata (Hinds, 1843)
Pl. 15, fig. 9

1843b *Neaera lata* Hinds, p. 79.
1855 *Neaera fragilis* Adams, p. 226.
1858 *Theora lata* - Adams & Adams, p. 370, pl. 97, figs. 5, 5a.
1909 *Theora lata* - Lynge, p. 214, pl. 4, figs. 9-11.
Not 1968 *Theora lata* - Habe, p. 199, pl. 61, fig. 17 (= *Theora lubrica* Gould, 1861).
1969 *Theora (Theora) lata* - Treatise I. P., p. 637, fig. E120 (6).
Not 1990 *Theora lata* - Noda & Sato, pl. 5, fig. 2 (= *Theora lubrica* Gould, 1861).
1992 *Theora (Theora) fragilis* - Lamprell & Whitehead, n. 435, pl. 57, fig. 435.

This distinctive species is featured by 1) elongate-oval, inequilateral, thin and translucent shell attaining 20 mm in length, 2) anterior side oval, 3) posterior side tapering, with roundly pointed edge, 4) ventral margin with an obtuse posterior angulation, 5) hinge weak, with 1 cardinal, 1 anterior and 1 posterior lateral in each valve, 6) pallial sinus wide and deep, confluent, with subangular upper border, 7) outer surface with very fine commarginal lines. LYNGE (1909), on the basis of direct examination of the original material, stated that *Neaera fragilis* Adams, 1856 is indistinguishable from *Neaera lata*. *Theora lubrica* Gould, 1861 is similar in several respects, but has an anterior inner radial rib.
DISTRIBUTION AND HABITAT. *Theora lata* is distributed from Malaya to Indonesia and northward to China Sea. It is very common in muddy substrates, from the intertidal zone down to 100 m (BERNARD et al., 1993). Former records in the Gulf of Thailand were from the mud flat seaward of the mangrove forest, and from muddy bottoms at depths of 5-20 m (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Family PSAMMOBIIDAE
Subfamily *Psammobiinae*

Gari (Gari) simplex (Sowerby, 1894)
Pl. 15, fig. 8

1906 *Gari simplex* - Melvill & Standen, p. 842.
1909 *Psammobia simplex* - Lynge, p. 212, pl. 4, figs. 6-8.
1932 *Gari (Gari) simplex* - Prashad, p. 301.

Gari simplex is distinguished by 1) ovate-quadrangular, moderately inequilateral shell up to 16 mm in length, 2) anterior side elongate-oval, 3) posterior side somewhat attenuated, subtrucate, with distinct postero-ventral angulation, 4) hinge with 2 cardinal teeth in each valve, 1 anterior and 1 posterior distant right laterals, 5) pallial sinus oval, wide and deep, extending slightly beyond midline, 6) outer surface with even commarginal low cords and fine radial threads over the posterior area.
DISTRIBUTION AND HABITAT. The species is distributed in the eastern Indian Ocean and Southwest Pacific. In the Gulf of Thailand it was recorded mostly from muddy bottoms in the upper infralittoral zone (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Gari (Psammotaena) elongata (Lamarck, 1818)
Pl. 15, fig. 10

1909 *Psammotaea violacea* - Lynge, p. 213.
1960 *Sanguinolaria (Psammotea) violacea* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 193, fig. 159.
1965 *Psammotea elongata* - Kira, p. 170, pl. 60, fig. 3.
1977 *Psammotea elongata* - Habe, p. 221, pl. 47, fig. 4.
1979 *Gari elongata* - Tantanasiriwong, p. 11.
1982 *Psammotea elongata* - Abbott & Dance, p. 347, fig. in bottom row, left.
1986 *Gari elongata* - Springsteen & Leobrera, p. 300, pl. 85, fig. 14.
1992 *Psammotaea elongata* - Lamprell & Whitehead, n. 402, pl. 54, fig. 402.
1993 *Gari (Psammotaena) elongata* - Willan, p. 61, figs. 246-268, 399, 400 (*cum syn.*).

The species has 1) elongate, ovate-subquadrangular, inequilateral shell attaining 65 mm in length, 2) anterior side oval, 3) posterior side obliquely subtruncate, 4) hinge with 2 cardinal teeth in each valve, 5) pallial sinus wide and deep, extending somewhat beyond mid-line, 6) outer surface violet, with uneven commarginal lines. The Red Sea *Psammotella ruppelliana* Reeve, 1857 differs in having larger, thinner, more compressed and more inequilateral shell with broadly rounded posterior end (WILLAN, 1993).
DISTRIBUTION AND HABITAT. *Gari elongata* ranges from Seychelles

to New Caledonia and northward to China and Japan. It occurs in the intertidal and infralittoral zones in sandy, muddy and shell bottoms (TANTANASIRIWONG, 1979; BERNARD et al., 1993). PURCHON & PURCHON (1981, sub *violacea* Lamarck) reported on the common occurrence of the species, lying deep in the sand, in shallow drainage channels on sandy shores of Malaya. According to WILLAN (1993), *Gari elongata* is a strictly intertidal element dwelling in sheltered sand banks and mud flats; lagoons and mangrove forests with sandy substrates are the most preferred locations.
FOSSIL RECORDS: none recorded.

Soletellina diphos (Linnaeus, 1771)
Pl. 15, fig. 11

1960 *Sanguinolaria (Soletellina) diphos* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 191, fig. 157.
1965 *Hiatula diphos* - Kira, p. 171, pl. 60, fig. 11.
1969 *Sanguinolaria (Soletellina) diphos* - Treatise I. P., p. N 634, fig. E 117 (4).
1982 *Hiatula diphos* - Abbott & Dance, p. 347, fig. in bottom row, rigth.

The present species differs from *Gari elongata* (Lamarck, 1818) in having 1) somewhat slenderer shell and 2) elongate, more attenuated and subrostrate posterior part.
DISTRIBUTION AND HABITAT. *Soletellina diphos* ranges from East Africa to New Caledonia and northward to China and Japan. According to BERNARD et al. (1993), it occurs intertidally and down to 20 m depth, in mud and sand.
FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Solecurtinae*

Solecurtus exaratus (Philippi, 1849)
Pl. 16, fig. 1

1960 *Solenocurtus exaratus* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 195, fig. 161.
1978 *Solecurtus exaratus* - Kirtisinghe, p. 38, pl. 19, fig. 6.
1984 *Solecurtus* sp. Dheeradilok, Chaimanee, Piccoli & Robba, pl. 2, fig. 8.

The species is featured by 1) elongate-subrectangular, markedly inequilateral shell up to 100 mm in length, 2) beaks at the anterior two-fifth, 3) ends regularly rounded, 4) hinge with 2 right, 1 left weak cardinal teeth, 5) pallial sinus very deep, nearly reaching the anterior adductor scar, 6) outer surface with uneven commarginal growth markings crossed by fine ridges that are subvertical posteriorly, oblique on the middle part, bent upward and obsolescent over the anterior side. *Solecurtus rhombus* (Spengler, 1802) is similarly sculptured, but has vertically truncated ends.
DISTRIBUTION AND HABITAT. According to BERNARD et al. (1993), *Solecurtus exaratus* ranges from Philippines to South China Sea, dwelling in sand and mud at depths of from 5 to 30 m.
FOSSIL RECORDS: Late Miocene and Pliocene of Indonesia; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Azorinus abbreviatus (Gould, 1861)
Pl. 16, fig. 2

1885 *Solecurtus (Azor) coarctatus* - Smith, p. 79.
1909 *Solecurtus (Azor) emarginatus* - Lynge, p. 279.
1924 *Solenocurtus abbreviatus* - Cossmann, p. 143, pl. 8, figs. 8, 9.
1932 *Solecurtus (Azor) coarctatus* - Prashad, p. 311.
1946 *Solecurtus (Azor) coarctatus* - Abrard, p. 46, pl. 4, fig. 5.
1954 *Azorinus abbreviatus* - Taki & Oyama, pl. 8, figs. 12, 13.
1960 *Azorinus abbreviatus* - Makiyama, pl. 105, fig. 12.
1965 *Azorinus abbreviatus* - Kira, p. 169, pl. 59, fig. 21.
1971 *Azorinus (Azorinus) abbreviatus* - Shuto, p. 51, pl. 6, figs. 17, 18; text fig. 11.
1971 *Azorinus abbreviatus* - Kuroda, Habe & Oyama, p. 446, pl. 98, fig. 6.
1977 *Azorinus abbreviatus* - Habe, p. 225, pl. 47, figs. 9, 10.
1984 *Azorinus coarctatus* - Sharabati, pl. 38, fig. 12.
1986 *Azorinus abbreviatus* - Sato, Masuda & Shuto, p. 34, pl. 4, figs. 10-12.
1989 *Azorinus abbreviatus* - Ito, p. 64, pl. 26, fig. 1.
1992 *Azorinus coarctatus* - Oliver, p. 165, pl. 31, fig. 8.
1994 *Azorinus abbreviatus* - Scott, p. 92, pl. 13, fig. C.
1995 *Azorinus abbreviatus* - Scott, p. 44, fig. in same page, bottom left.
1995 *Azorinus coarctatus* - Bosch, Dance, Moolenbeek & Oliver, p. 263, fig. 1183.
1995 *Azorinus coarctatus* - Kubo & Kurozumi, p. 195, fig. 14.

Azorinus abbreviatus is readily recognized by 1) elongate-subrectangular, inequilateral shell attaining 50 mm in length, 2) anterior end rounded, posterior one obliquely subtruncate, 3) ventral margin slightly concave in the middle, 4) hinge with 2 weak cardinal teeth in each valve, 5) pallial sinus rounded, somewhat upward directed, nearly reaching the beaks, 6) outer surface with a median, shallow radial depression and uneven growth markings. *Solen coarctatus* Gmelin, 1791 is a junior synonym of *Solen chamasolen* Da Costa, 1778 which is a related Mediterranean species that lacks the median radial depression. Available names for the Indo-Pacific form seem to be *emarginatus* Spengler, 1794 and *abbreviatus* Gould, 1861; we provisionally follow SCOTT (1994) in using *abbreviatus* Gould.
DISTRIBUTION AND HABITAT. The species is widely distributed in the Indo-Pacific, ranging from the Red Sea to Torres Strait and northward to Japan and China. According to BERNARD et al. (1993), it occurs in intertidal and infralittoral sandy and muddy substrates. Previous records in the Gulf of Thailand were from muddy substrates in the 5-70 m bathymetric interval (LYNGE, 1909; SCOTT, 1995).
FOSSIL RECORDS: Early Miocene of India; Middle Miocene of India and Myanmar; Upper Miocene of India and Indonesia; Pliocene of India, Indonesia, Philippines, Taiwan, Japan, New Hebrides and Fiji; Quaternary of Indo-Pacific area; Holocene of Thailand.

Family *DONACIDAE*

Donax faba Gmelin, 1791
Pl. 16, fig. 3

1909 *Donax (Latona) faba* - Lynge, p. 217.
1932 *Donax (Latona) faba* - Prashad, p. 204.
1956 *Donax faba* - Satyamurti, p. 147, pl. 22, fig. 4.
1960 *Donax faba* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 186, fig. 153.
1968 *Latona faba* - Habe, p. 195, pl. 60, fig. 15.
1976a *Donax faba* - Nielsen, p. 6, fig. 71.
1978 *Donax (Latona) faba* - Cernohorsky, p. 185, pl. 67, fig. 4.
1982 *Donax faba* - Abbott & Dance, p. 346, fig. in top row, left.
1985 *Donax faba* - Ansell, p. 31, pl. 1, fig. C; text-fig. 3C.
1992 *Donax (Latona) faba* - Lamprell & Whitehead, n. 380, pl. 51, fig. 380.

This is a common species readily recognized by 1) ovate-trigonal, markedly inequilateral shell attaining 25 mm in length, 2) anterior side elliptical, rather tapering, posterior side subtriangular and much shorter, 3) ventral margin with slight posterior sinuation, 4) pallial sinus ascending, rather deep and moderately wide, reaching mid-length, 5) sculpture of uneven, fine commarginal cords that are flat-topped anteriorly and of exceedingly fine, dense radial striation; outer surface reddish, greenish or light brown mottled with darker color, some specimens white with brown rays.

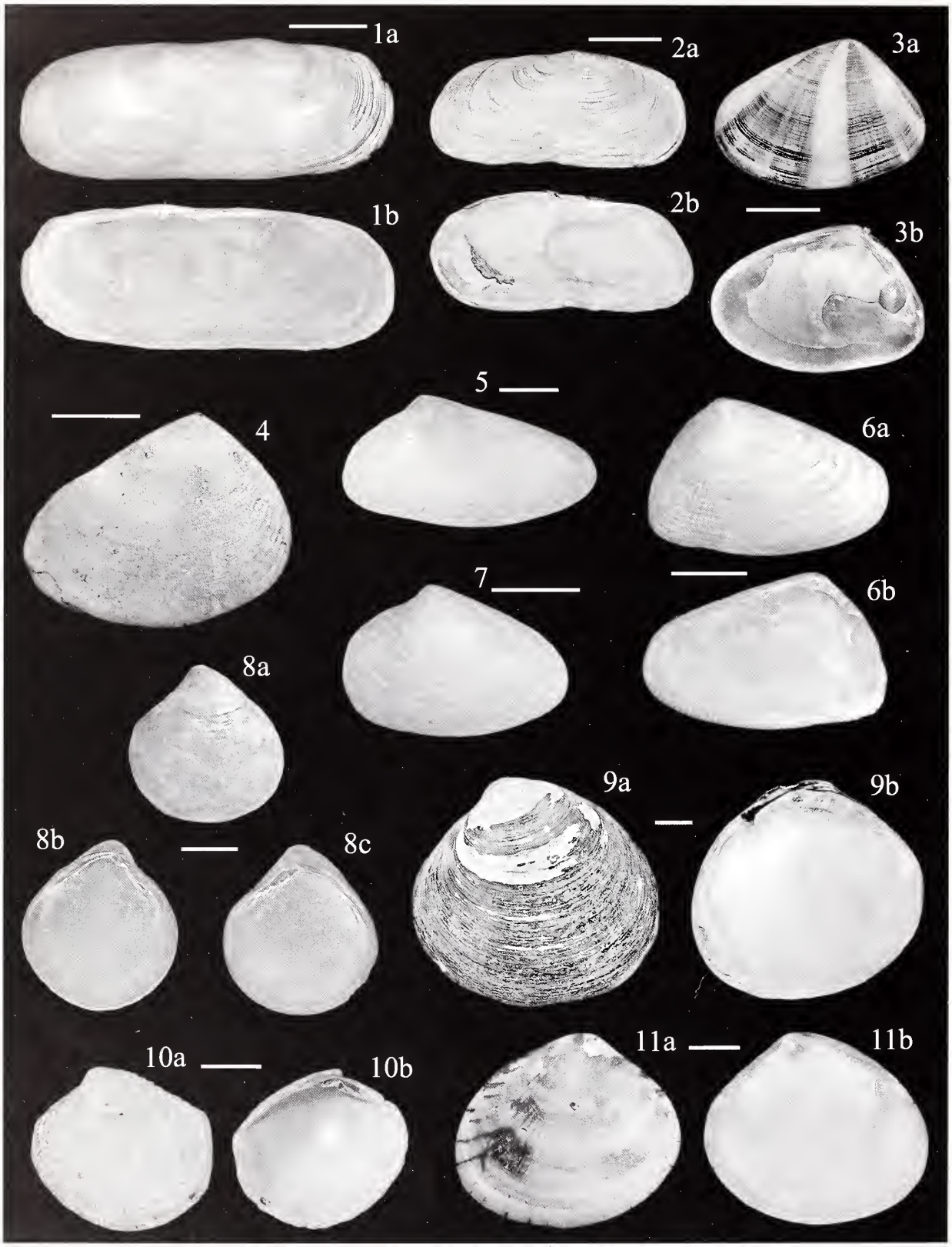

Plate 16: Figs. 1a, 1b. *Solecurtus exaratus* (Philippi, 1849), sand spit near Ban Laem Phak Bia; scale bar 20 mm. Figs. 2a, 2b. *Azorinus abbreviatus* (Gould, 1861), Sena-nivate, Quarry 2, level SEN 2, Holocene; scale bar 10 mm. Figs. 3a, 3b. *Donax faba* Gmelin, 1791, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Fig. 4. *Donax incarnatus* Gmelin, 1791, Locality TH 42 A, Holocene; scale bar 5 mm. Fig. 5. *Donax nitidus* Deshayes, 1854, Station TH 33; scale bar 1 mm. Figs. 6a, 6b. *Donax semigranosus* Dunker, 1877, sand spit near Ban Laem Phak Bia; scale bar 3 mm. Fig. 7. *Donax ticaonicus* Hanley, 1845, Station TH 33; scale bar 2 mm. Figs. 8a, 8b, 8c. *Alveinus ojianus* (Yokoyama, 1927), Station TH 10 (8a), Station TH 103 (8b), Station TH 71 (8c); scale bar 0.5 mm. Figs. 9a, 9b. *Polymesoda (Geloina) bengalensis* (Lamarck, 1818), Station TH 18; scale bar 10 mm. Figs. 10a, 10b. *Periglypta puerpera* (Linnaeus, 1771), Station TH 108; scale bar 2 mm. Figs. 11a, 11b. *Gafrarium dispar* (Dillwyn, 1817), sand spit near Ban Laem Phak Bia; scale bar 10 mm.

DISTRIBUTION AND HABITAT. *Donax faba* is widely distributed in the Indo-Pacific, from Madagascar to Fiji Islands and northward to Japan. It is an intertidal element occurring in poorly sorted sand on sheltered beaches (ANSELL, 1985). Previous records in Thailand were from coarse sand in the uppermost part of the intertidal zone (TANTANASIRIWONG, 1979).
FOSSIL RECORDS: none recorded.

Donax incarnatus Gmelin, 1791
Pl. 16, fig. 4

1960 *Donax incarnatus* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiqian, p. 185, fig. 152.
1985 *Donax incarnatus* - Ansell, p. 31, pl. 1, fig. A; text-fig. 3B.

The species is featured by 1) trigonal-ovate, elevated, markedly inequilateral shell attaining 19 mm in length, 2) quickly attenuated anterior side, 3) steeply sloping posterior margin, forming a rounded angle with the ventral margin, 4) ventral margin arched, more rapidly ascending posteriorly, its inner side finely crenulated, 5) hinge with 2 cardinal teeth, 1 anterior and 1 posterior lateral tooth in each valve, 6) pallial sinus ascending, rather deep and wide, 7) sculpture of undulating commarginal wrinkles over the posterior area.
DISTRIBUTION AND HABITAT. *Donax incarnatus* ranges from India to Indonesia and northward to South China Sea. It is an intertidal sand dweller (BERNARD et al., 1993). According to ANSELL (1985), the species occurs at moderately exposed locations and tend to select slightly finer sand when associated with *Donax cuneatus* (LINNAEUS, 1758).
FOSSIL RECORDS: none recorded.

Donax nitidus Deshayes, 1854
Pl. 16, fig. 5

1854b *Donax nitida* Deshayes, p. 350.
1885 *Donax nitidus* - Smith, p. 112.
1906 *Donax (Serrula) nitidus* - Melvill & Standen, p. 826.
1909 *Donax (Serrula) nitidus* - Lynge, p. 216.
1992 *Donax nitidus* - Oliver, p. 160. Pl. 32, fig. 5.
1995 *Donax nitidus* - Bosch, Dance, Moolenbeek & Oliver, p. 259, fig. 1158.

Donax nitidus is featured by 1) wedge-shaped, twice as long as high, markedly inequilateral shell not exceeding 10 mm in length, 2) anterior side long, attenuated, 3) posterior side obliquely truncated, 4) hinge with 2 right, 3 left cardinal teeth and 1 posterior lateral tooth in each valve, close to the cardinals, 5) pallial sinus oval, reaching the level of the anterior cardinal, 6) inner side of the ventral margin crenulated, more coarsely toward the posterior end, 7) outer surface with fine commarginal and radial striation, posterior area with raised, slightly oblique sharp ridges.
DISTRIBUTION AND HABITAT. The species is distributed in the Indo-Pacific, from the Red Sea to Australia and northward to China Sea. According to BERNARD et al. (1993), *Donax nitidus* dwells in sand, from the intertidal zone down to 30 m depth. Previous records in the Gulf of Thailand were from sand and gravel at depths of 9-30 m (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Donax semigranosus Dunker, 1877
Pl. 16, fig. 6

? 1909 *Donax (Serrula) incarnatus* - Lynge, p. 215, pl. 4, figs. 12, 13.
1954 *Donax (Latona) cuneatus* - Taki & Oyama, pl. 29, figs. 8, 9.
1965 *Chion semigranosum* - Kira, p. 168, pl. 59, fig. 14.
1971 *Chion semigranosus* - Kuroda, Habe & Oyama, p. 441, pl. 97, figs. 5, 6.
1977 *Chion dysoni semigranosus* - Habe, p. 190, pl. 37, figs. 7, 8.
1985 *Donax semigranosus* - Ansell, p. 30, pl. 1, fig. B; text-figs. 3D, 5.

Donax semigranosus is distinguished by 1) trigonal, markedly inequilateral shell attaining 17 mm in length, 2) anterior side strongly attenuated, with narrowly rounded end, 3) posterior side short, obliquely truncated, 4) inner ventral margin rather coarsely crenulated, 5) hinge with 2 cardinal teeth, 1 anterior and 1 posterior lateral tooth in each valve, the right laterals stronger, 6) pallial sinus wide, with undulating upper border, extending to the level of the anterior lateral tooth, 7) outer surface with fine radial and commarginal striation over the anterior part; the posterior part bears commarginal cords and radial ribs forming a square-reticulated pattern. The present species was regarded as a synonym of *Donax dysoni* Deshayes, 1854 (cf. BERNARD et al., 1993), but the relationships between these two taxa are unclear. *Donax erythraeensis* Bertin, 1881 is similarly shaped and sculptured, but has the reticulated pattern restricted to the posterior slope.
DISTRIBUTION AND HABITAT. *Donax semigranosus* was hitherto known from South China Sea and Southern Japan. It is an intertidal element occurring in fine, well sorted sand in more exposed locations (ANSELL, 1985).
FOSSIL RECORDS: Quaternary of Japan; Holocene of Thailand.

Donax ticaonicus Hanley, 1845
Pl. 16, fig. 7

1845b *Donax ticaonicus* Hanley, p. 14.
1977 *Chion ticaonicus* - Habe, p. 190.

A few juvenile fossil valves were recovered, featured by 1) elongate, wedge-shaped, markedly inequilateral shell, 2) anterior side occupying two-thirds of total length, attenuated, with rounded end, 3) posterior side abruptly truncated, 4) hinge strong, with 1 triangular cardinal tooth and 1 posterior lateral in the right valve, 2 divergent cardinal teeth, 1 approximate posterior lateral and 1 distant anterior lateral in the left valve, 5) pallial sinus ascendent, subquadrangular, extending somewhat beyond the cardinal teeth, 6) outer surface with commarginal low ridges, weaker anteriorly, and faint radial striation that renders granose the ridges over the posterior area.
DISTRIBUTION AND HABITAT. The species is an intertidal sand dweller, reported to range from Philippines to Taiwan (BERNARD et al., 1993).
FOSSIL RECORDS: Holocene of Thailand.

Superfamily ARCTICOIDEA
Family *KELLIELLIDAE*

Alveinus ojianus (Yokoyama, 1927)
Pl. 16, fig. 8

1954 *Alvenius ojianus* - Taki & Oyama, pl. 47, figs. 7, 8.
1977 *Alvenius ojianus* - Habe, p. 233, pl. 49, figs. 1, 2.
1980 *Alveinus ojianus* - Volova & Scarlato, p. 52, fig. 46.
1982 *Alvenius philippinensis* Shuto, p. 116, pl. 18, figs. 18-24; text-fig. 3.
1986 *Alvenius ojianus* - Takayasu, pl. 73, fig. 2.
1990 *Alvenius ojianus* - Ito, p. 126, pl. 32, fig. 8.

This tiny form is featured by 1) subcircular to roundly trigonal, subequilateral, inflated shell not exceeding 2 mm in length, 2)

beaks prominent, prosogyrate, 3) trigonal ligament pit under beaks, 4) right valve with 2 cardinal teeth immediately anterior to the beak, upper one tuberculiform, lower one strong and parallel to the margin, 5) left valve with 1 asymmetrically A-shaped cardinal tooth, 6) adductor scars oval, placed above midline, 7) a distinct groove on the inner margins of the right valve except for the antero-dorsal one, this latter being grooved only in the left valve, 8) outer surface with commarginal growth markings. *Alvenius* is an uncorrect spelling for *Alveinus*. *Alveinus philippinensis* Shuto, 1982 appears to be undistinguishable from *Alveinus ojianus*.

DISTRIBUTION AND HABITAT. The species was reported to range from Yellow Sea to Japan. According to BERNARD et al. (1993), it dwells in sandy bottoms 10-30 m deep. ITO (1990) recovered the species from the 80-139 m bathymetric interval.

FOSSIL RECORDS: Late Middle Miocene of Indonesia and Philippines; Quaternary of Japan; Holocene of Thailand.

Superfamily CORBICULOIDEA
Family *CORBICULIDAE*

Polymesoda (Geloina) bengalensis (Lamarck, 1818)
Pl. 16, fig. 9

1932 *Geloina bengalensis* - Prashad, p. 175.
1953 *Polymesoda bengalensis* - Van Benthem Jutting, p. 49, fig. 10.
1974 *Polymesoda (Geloina) bengalensis* - Brandt, p. 310, pl. 28, fig. 83.
1983 *Geloina bengalensis* - Morton, p. 110-113, fig. 6 (1).
1984 *Geloina bengalensis* - Morton, pp. 77-84, pl. 1, fig. B; pl. 2, fig. B.
? 1984 *Geloina ceylonica* - Plaziat, p. 116, fig. 4 (s).

Polymesoda bengalensis is distinguished by 1) subtrigonal, inequilateral, thick shell up to 95 mm in length, 2) steep, slightly concave antero-dorsal margin, 3) biangulate posterior side, 4) hinge robust, with 3 elongate cardinal teeth in each valve, 2 right, 1 left anterior laterals, 2 right, 1 left posterior laterals, 5) pallial line devoid of sinus, 6) outer surface with a very weak posterior radial depression and uneven growth markings.

DISTRIBUTION AND HABITAT. *Polymesoda bengalensis* appears to be particularly associated with the mangroves of the Ganges and Irrawaddi deltas and the smaller estuaries of the western coast of Thailand (MORTON, 1983). BRANDT (1974) reported it as common in the mud flats and estuaries in Thailand. It is of note that *Geloina* species are high-zoned in the mangal.

FOSSIL RECORDS: Holocene of Thailand (Bangkok Clay).

Superfamily VENEROIDEA
Family *VENERIDAE*
Subfamily *Venerinae*

Periglypta puerpera (Linnaeus, 1771)
Pl. 16, fig. 10

1927 *Antigona puerpera* - Cox, p. 100.
1932 *Antigona puerpera* - Prashad, p. 248.
1960 *Venus (Periglypta) puerpera* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 172, fig. 143.
1965 *Periglypta puerpera* - Kira, p. 160, pl. 57, fig. 12.
1972 *Periglypta puerpera* - Cernohorsky, p. 233, pl. 66, fig. 5.
1974 *Antigona puerpera* - Fischer-Piette, p. 269, text-fig. 2.
1975 *Venus puerpera* - Fischer-Piette, p. 32, pl. 3, figs. 25-29; pl. 4, figs. 30-33 (*cum syn.*).
1976a *Periglypta puerpera* - Nielsen, p. 7, fig. 75.
1977 *Periglypta (Periglypta) puerpera* - Habe, p. 247, pl. 51, figs. 6, 7.
1981 *Periglypta puerpera* - Eisenberg, 169, pl. 151, fig. 18.
1982 *Periglypta puerpera* - Abbott & Dance, p. 353, fig. in middle lower row, middle.
1984 *Periglypta reticulata* - Sharabati, pl. 49, fig. 11.
1984 *Periglypta puerpera* - Matsukuma, p. 25, pl. 5, fig. 12.
1991 *Periglypta puerpera* - Abbott, p. 101, pl. 48, fig. 11.
Not 1992 *Periglypta puerpera* - Oliver, p. 180, pl. 38, fig. 4 (= *Venus reticulata* Linnaeus, 1758).
1992 *Periglypta reticulata* - Oliver, p. 180, pl. 38, fig. 3.
1992 *Periglyta puerpera* - Dharma, pl. 25, fig. 13.
1992 *Antigona (Periglypta) puerpera* - Lamprell & Whitehead, n. 457, pl. 60, fig. 457.
1994 *Periglypta reticulata* - Coulombel, p. 133, fig. in top and bottom rows, right.
Not 1995 *Periglypta puerpera* - Bosch, Dance, Moolenbeek & Oliver, p. 265, fig. 1189 (= *Venus reticulata* Linnaeus, 1758).
1995 *Periglypta reticulata* - Bosch, Dance, Moolenbeek & Oliver, p. 265, fig. 1190.
1995 *Periglypta puerpera* - Kubo & Kurozumi, p. 199, fig. 1.

The species is herein intended according to FISCHER-PIETTE (1974, 1975). It is featured by 1) ovate-quadrangular, large shell up to 70 mm in length, 2) gently arched lower margin of the hinge plate and 3) sculpture of well spaced, fluted commarginal lamellae and crowded, thin radial riblets. *Periglypta puerpera* has been often confused with the strictly related *Periglypta reticulata* (Linnaeus, 1758). The latter differs in having 1) more sinuous, ventrally projecting lower margin of the hinge plate, 2) narrower and sloping anterior right cardinal tooth, 3) coarser middle right cardinal and 4) coarser sculpture.

DISTRIBUTION AND HABITAT. *Periglypta puerpera* is widely distributed in the Indo-Pacific, from Madagascar to Polynesia and reaches as far north as southern Japan. It is reported to dwell in sandy bottoms intertidally and down to 20 m depth (BERNARD et al., 1993). Previous records in Thai waters were from muddy sand of reef flats (NIELSEN, 1976; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Pliocene of Zanzibar; Quaternary of the Indo-Pacific.

Subfamily *Circinae*

Gafrarium dispar (Dillwyn, 1817)
Pl. 16, fig. 11

1909 *Circe (Crista) dispar* - Lynge, p. 235.
1932 *Gafrarium dispar* - Prashad, p. 230.
1956 *Gafrarium dispar* - Satyamurti, p. 109, pl. 15, fig. 5.
1972 *Gafrarium dispar* - Cernohorsky, p. 234, pl. 67, figs. 3, 3a.
1976a *Gafrarium dispar* - Nielsen, p. 7, fig. 79.
1977 *Gafrarium dispar* - Habe, p. 255, pl. 52, figs. 6, 7.
1992 *Gafrarium dispar* - Lamprell & Whitehead, n. 503, pl. 65, fig. 503.
1992 *Gafrarium dispar* - Oliver, p. 182, pl. 39, fig. 7.
1992 *Gafrarium dispar* - Dharma, p. 96, pl. 26, fig. 3.
1995 *Gafrarium disper* - Kubo & Kurozumi, p. 198, top fig.; p. 200, fig. 6.

Distinctive characters are 1) ovate, inequilateral, longer than high, thick shell up to 38 mm in length, 2) lunule lanceolate, slightly impressed, 3) pallial sinus wanting, 4) sculpture of fine, divaricating riblets over the posterior part, obsolescent over the rest of the shell; fresh specimens exhibit reddish-brown radial lines and darker chevrons over the lunule.

DISTRIBUTION AND HABITAT. *Gafrarium dispar* ranges from the Red Sea to Fiji and northward to Japan. It occurs intertidally and down to 20 m depth, in coarse sand and gravel (BERNARD et al., 1993). Previous records in Thai waters were from coarse sand among coral blocks at depths not exceeding 2 m (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: none recorded.

Dorisca melvilli (Lynge, 1909)

Pl. 17, fig. 1

1909 *Circe melvilli* Lynge, p. 231, pl. 4, figs. 32, 33.

This distinctive species is featured by 1) roundly triangular, subequilateral, somewhat inflated shell not exceeding 4 mm in length, 2) beaks pointed, slightly anterior to mid-length, 3) antero-dorsal and postero-dorsal margins gently convex, equally sloping, 4) ventral margin broadly arched, 5) lunule lanceolate, clearly demarcated, 6) hinge with 3 cardinal teeth in each valve, 2 anterior right, 1 anterior left laterals that are approximate and parallel to the margin, 7) pallial sinus inconspicuous, 8) sculpture of anterior and posterior, straight radial riblets and commarginal cords that are granulated on crossing the riblets; umbonal area nearly smooth. *Dorisca nana* (Melvill, 1898) is related, but has oval outline and denser, divaricating riblets.

DISTRIBUTION AND HABITAT. The species is so far known from the Gulf of Thailand. The original material was recovered predominantly from mud or sandy mud at depths of 5 -54 m (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Subfamily *Sunettinae*

Sunetta (Cyclosunetta) contempta Smith, 1891

Pl. 17, fig. 2

1891 *Sunetta contempta* Smith, p. 422.
1906 *Sunetta contempta* - Melvill & Standen, p. 831.
1964 *Sunetta contempta* - Spry, p. 33, pl. 3, fig. 160.
1974 *Sunetta contempta* - Fischer-Piette, p. 278.
1981 *Sunetta contempta* - Richards, p. 88, pl. 58, fig. 507.
1992 *Sunetta (Cyclosunetta) contempta* - Oliver, p. 184, pl. 42, fig. 8.
1992 *Sunetta contempta* - Lamprell & Whitehead, n. 510, pl. 66, fig. 510.
1995 *Cyclosunetta contempta* - Bosch, Dance, Moolenbeek & Olier, p. 271, fig. 1217.

The species is featured by 1) ovate, subequilateral shell attaining 20 mm in length, 2) anterior side oval, 3) posterior side subtruncate, 4) escutcheon very long and narrow, rather deeply incised, 5) pallial sinus ascending, moderately deep, not reaching mid-length, 6) inner margin finely denticulate, 7) outer surface smooth, shining, pale violet or yellowish with brown chevrons.

DISTRIBUTION AND HABITAT. *Sunetta contempta* ranges widely in the Indo-Pacific, from South Africa to Australia and northward to Taiwan, dwelling in infralittoral sandy and muddy bottoms (BERNARD et al, 1993). On the east coast of Malaya it was recovered from intertidal sands and also obtained from trash fish (PURCHON & PURCHON, 1981; MORRIS & PURCHON, 1981).

FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Chioninae*

Anomalocardia (Anomalodiscus) squamosa (Linnaeus, 1758)

Pl. 17, fig. 3

1909 *Cryptogramma squamosa* - Lynge, p. 241.
1932 *Anomalocardia (Anomalodiscus) squamosa* - Prashad, p. 260.
1960 *Chione (Anomalodiscus) squamosa* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 168, fig. 139.
1965 *Anomalodiscus squamosus* - Kira, p. 164, pl. 58, fig. 16.
1977 *Anomalodiscus squamosus* - Fischer-Piette & Vukadinovic, p. 51, text-fig- 13.
1981 *Anomalodiscus squamosus* - Eisenberg, p. 167, pl. 149, fig. 16.
1982 *Anomalocardia squamosa* - Abbott & Dance, p. 366, fig. in bottom row, right.
1986 *Anomalocardia (Anomalodiscus) squamosa* - Springsteen & Leobrera, p. 304, pl. 86, fig. 13.
1992 *Anomalocardia (Anomalodiscus) squamosa* - Lamprell & Whitehead, n. 465, pl. 61, fig. 465.
1993 *Anomalodiscus squamosus* - Janssen, p. 418, pl. 8, fig. 65 (lectotype of *Venus roemeri* Dunker, 1860).

This is a distinctive species featured by 1) ovate-triangular, inequilateral shell up to 45 mm in length, 2) anterior side rounded, posterior one somewhat longer, triangular and subrostrate, 3) obtuse posterior ridge preceded by a slight radial depression, 4) ventral margin rather coarsely crenulate, 5) pallial sinus small, 6) sculpture of nodose radial ribs overridden by commarginal cords.

DISTRIBUTION AND HABITAT. *Anomalocardia squamosa* ranges from Australia to Japan. According to BERNARD et al. (1993), it is an intertidal element dwelling in mud. Previous records in the Gulf of Thailand were from the strand of the mangrove at Koh Chang (LYNGE, 1909).

FOSSIL RECORDS: Late Miocene and Pliocene of Indonesia.

Placamen calophylla (Philippi, 1836)

Pl. 17, fig. 4

1885 *Venus (Chione) calophylla* - Smith, p. 122.
1909 *Chione (Circomphalus) calophylla* - Lynge, p. 246.
1932 *Chione (Clausinella) calophylla* - Prashad, p. 258.
1956 *Chione calophylla* - Satyamurti, p. 125, pl. 19, fig. 3.
1960 *Venus (Clausinella) calophylla* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 170, fig. 141.
1971 *Placamen calophylla* - Shuto, p. 60, pl. 8, figs. 8-19; text-fig. 12 (8-13).
1977 *Clausinella calophylla* - Fischer-Piette & Vukadinovic, p. 114, pl. 18, fig. 165; text-fig. 38 (*cum syn.*).
1981 *Clausinella calophylla* - Eisenberg, p. 168, pl. 150, fig. 15.
1982 *Bassina calophylla* - Abbott & Dance, p. 367, fig. in upper mid row, middle.
1982 *Bassina calophylla* - Bosch & Bosch, p. 190, upper mid fig.
1982 *Placamen calophylla* - Kanno, O'Hara & Caagusan, p. 79, pl. 15, fig. 13.
1986 *Placamen calophylla* - Springsteen & Leobrera, p. 304, pl. 86, fig. 12.
1988 *Placamen calophyllum* - Matsukuma & Yoosukh, p. 576, pl. 2, figs. 13-16; text-figs. 13-17.
1989 *Bassina calophylla* - Bosch & Bosch, p. 94, upper mid fig.
1992 *Placamen calophyllum* - Dharma, pl. 26, fig. 12.
1992 *Placamen calophyllum* - Lamprell & Whitehead, n. 475, pl. 62, fig. 475.
1994 *Placamen calophyllum* - Scott, p. 84, pl. 11, fig. C.
1995 *Bassina calophylla* - Bosch, Dance, Moolenbeek & Oliver, p. 266, fig. 1191.
1996 *Placamen calophylla* - Jansen, p. 48, pl. 4, fig. 196.

Placamen calophylla has 1) trigonal-ovate shell attaining 30 mm in lenght, 2) sculpture of distant, raised commarginal lamellae, usually 13 in fully grown specimens, 3) well marked anterior and much weaker posterior sinuation of the lamellae resulting in radial depressions and 4) dense commarginal striation in the interspaces between lamellae. The sculpture is the most distinctive feature.

DISTRIBUTION AND HABITAT. *Placamen calophylla* is distributed in the Indo-Pacific, from Madagascar to Australia and northward to East China Sea. It dwells in muddy sand, sand or shell gravel from the intertidal zone down to 100 m depth (BERNARD et al., 1993; BOSCH et al., 1995). Previous records in Thai waters were from muddy substrates, from low water mark to 36 m depth (LYNGE, 1909; TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Late Miocene of Indonesia and Philippines; Pliocene of India, Indonesia, Fiji, Philippines, Taiwan and Japan; Quaternary of Southeast Asia; Holocene of Thailand.

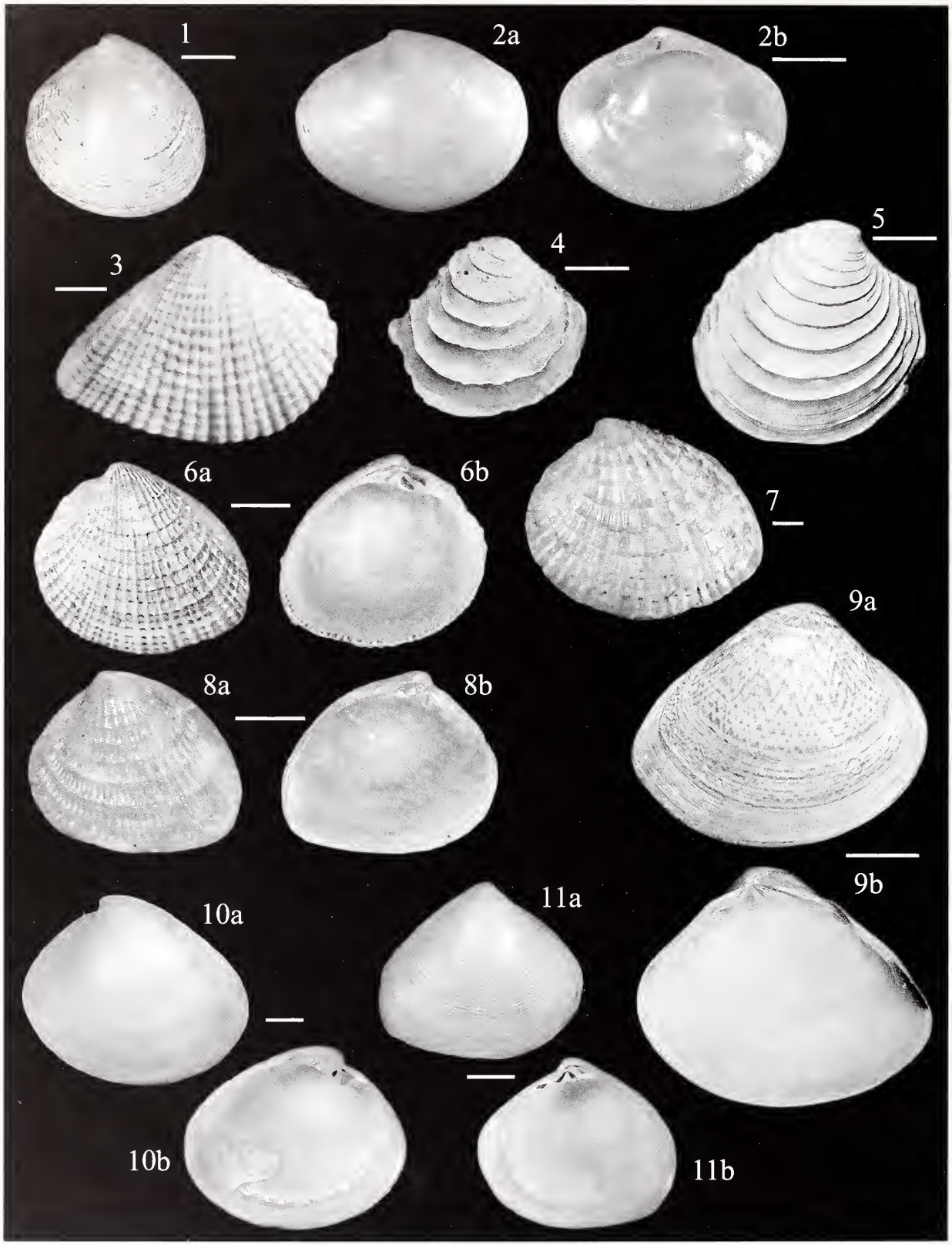

Plate 17: Fig. 1. *Dorisca melvilli* (Lynge, 1909), Station TH 108; scale bar 1 mm. Figs. 2a, 2b. *Sunetta (Cyclosunetta) contempta* Smith, 1891, sand spit near Ban Laem Phak Bia; scale bar 5 mm. Fig. 3. *Anomalocardia (Anomalodiscus) squamosa* (Linnaeus, 1758), sand spit near Ban Laem Phak Bia; scale bar 5 mm. Fig. 4. *Placamen calophylla* (Philippi, 1836), sand spit near Ban Laem Phak Bia; scale bar 5 mm. Fig. 5. *Placamen chloroticum* (Philippi, 1849), Ban Praksa, level BTN3, Holocene; scale bar 10 mm. Figs. 6a, 6b. *Timoclea (Timoclea) lionota* (Smith, 1885), Station TH 108; scale bar 1 mm. Fig. 7. *Timoclea (Chioneryx) scabra* (Hanley, 1844), Station TH 55; scale bar 1 mm. Figs. 8a, 8b. *Timoclea (Timoclea) siamensis* (Lynge, 1909), Station TH 40; scale bar 1 mm. Figs. 9a, 9b. *Meretrix meretrix* (Linnaeus, 1758), sand spit near Ban Laem Phak Bia; scale bar 20 mm. Figs. 10a, 10b. *Pitar (Pitarina) striatus* (Gray, 1838), Station TH 78; scale bar 2 mm. Figs. 11a, 11b. *Pitar (Costellipitar) manillae* (Sowerby, 1851), Station TH 27; scale bar 2 mm.

Placamen chloroticum (Philippi, 1849)

Pl. 17, fig. 5

1849 *Venus chlorotica* Philippi, p. 82, pl. 9, fig. 3.
1849 *Venus isabellina* Philippi, p. 83, pl. 9, fig. 5.
1909 *Chione (Circomphalus) isabellina* - Lynge, p. 247.
1933 *Venus (Chione) chlorotica* - Nomura, p. 84, pl. 3, fig. 17.
1935 *Chione (Circomphalus) isabellina* - Oostingh, p. 185, pl. 15, figs. 138-140.
1948 *Venus (Clausinella) isabellina* - Cox, p. 64, pl. 6, fig. 11.
1960 *Venus (Clausinella) isabellina* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 169, fig. 140.
1965 *Placamen isabellinum* - Kira, p. 165, pl. 58, fig. 21.
1977 *Clausinella chlorotica* - Fischer-Piette & Vukadinovic, p. 118 (*cum syn.*).
1978 *Placamen isabellina* - Popenoe & Kleinpell, pl. 15, fig. 189.
1981 *Placamen isabellina* - Eisenberg, pl. 152, figs. 6, 6a.
1982 *Clausinella chlorotica* - Abbott & Dance, p. 367, fig. in lower mid row, middle.
1982 *Clausinella isabellina* - Abbott & Dance, p. 367, fig. in lower mid row, right.
1988 *Placamen chloroticum* - Matsukuma & Yoosukh, p. 578, pl. 2, figs. 9-12; text figs. 15, 18, 19 (*cum syn.*).
1992 *Placamen chlorotica* - Dharma, p.96, pl. 26, fig. 13.

The species is similar to *Placamen calophylla* (Philippi, 1836) in several respects, but differs primarily in having 1) pallial sinus somewhat deeper, rounded instead of trigonal and 2) less widely spaced and less raised commarginal lamellae. *Venus isabellina* Philippi,1849 is indistinguishable from *Venus chlorotica* Philippi; this latter bears page priority.

DISTRIBUTION AND HABITAT. *Placamen chloroticum* ranges from India to Queensland and northward to China Sea. It is reported to dwell in sand and mud, intertidally and down to 25 m depth (BERNARD et al., 1993). The species was also recorded from mangrove swamps of Xiamen (LI FU-XIE & GAO SHI-HE, 1985). Previous records in the Gulf of Thailand were from the strand off the mangrove forest, in very shallow water (LYNGE, 1909).

FOSSIL RECORDS: Middle and Upper Miocene of Indonesia; Pliocene of Indonesia, Philippines, Taiwan and Japan; Quaternary of Indonesia; Holocene of Thailand.

Timoclea (Timoclea) lionota (Smith, 1885)

Pl. 17, fig. 6

1885 *Venus (Chione) lionota* Smith, p. 126, pl. 3, figs. 7-7b.
1909 *Chione (Timoclea) lionata* (sic) - Lynge, p. 245, pl. 5, figs. 8-10.
1977 *Timoclea lionota* - Fischer-Piette & Vukadinovic, p. 79, pl. 11, figs. 118-129; pl. 12, fig. 130; text-fig. 27.
1998 *Timoclea (Timoclea) lionata* (sic) - Lamprell & Healy, p. 250, fig. 763.

Timoclea lionota is featured by 1) roundly trigonal, small shell not exceeding 8 mm in length, 2) inner margin minutely denticulated and 3) sculpture of about 20 primary radial riblets, thinner and more approximated on the posterior slope, and of evenly spaced, slightly raised commarginal lamellae; a finer intercalary riblet settles in each interspace some distance from the umbonal area. The sculpture is the most distinctive character. *Timoclea mindanensis* (Smith, 1885) is closely related but differs in that has finer, more numerous riblets.

DISTRIBUTION AND HABITAT. *Timoclea lionota* appears to be distributed from New Guinea to Singapore and Thailand. It was recovered from muddy or shelly bottoms at depths of from 14 to 54 m (SMITH, 1885; LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Timoclea (Timoclea) siamensis (Lynge, 1909)

Pl. 17, fig. 8

1909 *Chione (Timoclea) siamensis* Lynge, p. 244, pl. 5, figs. 6, 7.
1977 *Timoclea siamensis* - Fischer-Piette & Vukadinovic, p. 67 (*cum syn.*).

The present species is featured by 1) ovate-trigonal, inequilateral shell not exceeding 8 mm in length, 2) sculpture of radial ribs and commarginal lamellae; 3-4 anterior and 6-9 posterior ribs are stronger than the middle ones which tend to bifurcate toward the ventral margin; the lamellae form beads on crossing the ribs. The beaded sculpture distinguishes *Timoclea siamensis* from the other related *Timoclea* species.

DISTRIBUTION AND HABITAT. According to FISCHER-PIETTE & VUKADINOVIC (1977), the species, originally described from the Gulf of Thailand, was also recovered from Madagascar and Japanese waters. The single record in the Gulf of Thailand was from sand and mud at a depth of 54 m (LYNGE, 1909).

FOSSIL RECORDS: none recorded.

Timoclea (Chioneryx) scabra (Hanley, 1844)

Pl. 17, fig. 7

1844c *Venus scabra* Hanley, p. 161.
1885 *Venus (Cryptogramma) scabra* - Martin, p. 208, pl. 11, fig. 208.
1885 *Venus (Chione) scabra* - Smith, p. 124.
1904 *Chione micra* Pilsbry, p. 552, pl. 41, figs. 4, 5.
1906 *Chione scabra* - Melvill & Standen, p. 835.
1909 *Chione (Timoclea) scabra* - Lynge, p. 244.
1932 *Chione (Timoclea) scabra* - Prashad, p. 257.
1956 *Chione scabra* - Satyamurti, p. 124, pl. 19, fig. 1.
1968 *Veremolpa micra* - Habe, p. 191, pl. 59, fig. 3.
Not 1968 *Veremolpa scabra* - Habe, p. 191, pl. 59, fig. 7.
1971 *Veremolpa micra* - Kuroda, Habe & Oyama, p. 430, pl. 93, fig. 10.
1977 *Veremolpa micra* - Habe, p. 250, pl. 53, figs. 3-5.
1977 *Timoclea scabra* - Fischer-Piette & Vukadinovic, p. 69, pl. 8, figs. 86-96; pl. 9, fig. 97; text fig. 19 (*cum syn.*).
1990 *Veremolpa micra* - Ito, p. 126, pl. 32, fig. 9.
1992 *Timoclea (Chioneryx) scabra* - Lamprell & Whitehead, n. 477, pl. 63, fig. 477.
1994 *Timoclea scabra* - Scott, p. 86, pl. 11, fig. D.
1995 *Timoclea scabra* - Scott, p. 46, fig. in same page.
1995 *Timoclea (Chioneryx) scabra* - Jansen, p. 110, fig. 459.

Timoclea scabra is a common species readily recognized by 1) ovate-trigonal, inequilateral shell attaining 15 mm in length, 2) pallial sinus narrow, rather shallow, upward directed and with narrowly rounded edge, 3) inner margins finely crenulated and 4) sculpture of broad, bifurcated radial ribs and widely spaced commarginal lamellae more raised on crossing the ribs. *Chione micra* Pilsbry, 1904 is currently regarded as a junior synonym of the present species.

DISTRIBUTION AND HABITAT. The species ranges from the Gulf of Oman to Queensland and northward to Japan and China (FISCHER-PIETTE & VUKADINOVIC, 1977), being a subtidal element (BERNARD et al., 1993). According to NARCHI (1980), it is a suspension feeder dwelling in soft substrates in quiet waters. *Timoclea scabra* is commonly trawled from muddy bottoms along the west coast of Malaya (PURCHON & PURCHON, 1981). In the Gulf of Thailand it was reported to occur very commonly in muddy substrates, at depths of 5-35 metres (LYNGE, 1909); up to date records are from muddy bottoms 60-70 m deep (SCOTT, 1995).

FOSSIL RECORDS: Upper Miocene to Quaternary of Indonesia; Holocene of Thailand.

Subfamily *Meretricinae*

Meretrix meretrix (Linnaeus, 1758)

Pl. 17, fig. 9

1858 *Meretrix impudica* - Adams & Adams, p. 423, pl. 107, figs. 6, 6a.
1885 *Cytherea meretrix* - Martin, p. 215, pl. 11, fig. 214.
1909 *Cytherea (Meretrix) meretrix* - Lynge, p. 226.
1932 *Meretrix meretrix* - Prashad, p. 212 (*cum syn.*).
1954 *Meretrix meretrix lusoria* - Taki & Oyama, pl. 31, fig. 4.
1960 *Meretrix meretrix* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 153, fig. 127.
1960 *Meretrix lusoria* - Thang Xi, Qi, Wang Zhongyan, Li Jiemin, Ma Xiutong Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 155, fig. 128.
1960 *Meretrix meretrix* - Makiyama, pl. 93, fig. 9.
1965 *Meretrix lusoria* - Kira, p. 159, pl. 57, fig. 1.
1969 *Meretrix meretrix* - Treatise I. P., p. N 673, fig. E 143 (1).
1971 *Meretrix lusoria* - Kuroda, Habe & Oyama, p. 419, pl. 94, figs. 3-6.
1971 *Meretrix meretrix* - Shuto, p. 53, pl. 8, figs. 3, 7; text-fig. 12 (1, 2).
1974 *Meretrix meretrix* - Fischer-Piette, p. 281.
1976 *Meretrix lusoria* - Lindner, p. 232, pl. 61, fig. 11.
1977 *Meretrix lusoria* - Habe, p. 273, pl. 56, fig. 6.
1978 *Meretrix lusoria* - Kirtisinghe, p. 30, pl. 14, fig. 1.
1980 *Meretrix lusoria* - Wu, p. 112, pl. 3, fig. N.
1981 *Meretrix lusoria* - Eisenberg, p. 169, pl. 151, fig. 8.
1982 *Meretrix lusoria* - Abbott & Dance, p. 355, fig. in upper mid row, right.
1986 *Meretrix meretrix* - Springsteen & Leobrera, p. 300, pl. 85, fig. 11.
1988 *Meretrix lusoria* - Matsukuma, Ozawa & Yoosukh, pl. 4, fig. 1.
1991 *Meretrix meretrix* - Abbott, p. 102, pl. 48, figs. 12, 13.
1992 *Meretrix meretrix* - Dharma, p. 96, pl. 26, fig. 6.

This is a variable species in terms of shape and color. Distinctive features are 1) trigonal to ovate-trigonal, inequilateral shell up to 70 mm in length, 2) pallial sinus small, reverse L-shaped, 3) outer surface with more or less abrupt posterior angulation and coarse, uneven growth markings.

DISTRIBUTION AND HABITAT. *Meretrix meretrix* is widely distributed in the Indo-Pacific, from South Africa to Indonesia and northward to Japan. According to BERNARD et al. (1993), it occurs intertidally and down to 20 m depth, in sand and mud. Previous records in Thai waters were from muddy sand flats seaward of mangrove forest and down to 10 m depth (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Upper Miocene of Japan; Pliocene of Indonesia, Philippines, Taiwan, China and Japan; Quaternary of West Pacific area; Holocene of Thailand.

Subfamily *Pitarinae*

Pitar (Costellipitar) manillae (Sowerby, 1851)

Pl. 17, fig. 11

1974 *Pitar manillae* - Fischer-Piette, p. 285, pl. 3, figs. 29-39 (*cum syn.*).
1992 *Pitar manillae* - Dharma, p. 96, pl. 26, fig. 5.

Pitar manillae differs from *Pitar striatus* (Gray, 1838) in having 1) trigonal, distinctly inequilateral shell attaining 23 mm in length and 2) sculpture of crowded, even and fine commarginal cords throughout.

DISTRIBUTION AND HABITAT. *Pitar manillae* ranges from South Africa to Philippines and China Sea. According to BERNARD et al. (1993), it thrives in muddy and sandy substrates from the intertidal zone down to 60 m depth. In the Andaman Islands, the species is reported to be common in mud, clay and shell debris between 33 and 115 m depth (BOSHOFF & FIELD, 1968).

FOSSIL RECORDS: none recorded.

Pitar (Pitarina) striatus (Gray, 1838)

Pl. 17, fig. 10

1909 *Cytherea (Caryatis) striata* - Lynge, p. 228.
1939 *Pitar (Pitar) striata* - Adam & Leloup, p. 83, pl. 5, fig. 6.
1965 *Pitar (Pitarina) striatum* - Kira, p. 164, pl. 58, fig. 12.
1977 *Pitar (Pitarina) striatum* - Habe, p. 257, pl. 52, figs. 14, 15.
1978 *Pitar striata* - Kirtisinghe, p. 30, pl. 14, fig. 5.
1984 *Pitar (Pitarina) striatus* - Matsukuma, p. 27, pl. 5, fig. 13.

Distinctive features are 1) oval, slightly inequilateral shell up to 36 mm in length, 2) hinge pitarine, 3) pallial sinus moderately deep, nearly extending to the level of beaks, upward directed and with rounded edge, 4) sculpture of commarginal fine cords that are less marked over the umbonal area.

DISTRIBUTION AND HABITAT. The species is distributed in the tropical Indo-Pacific as far east as the Caroline and Marshall Islands and northward to Japan. *Pitar striatus* is an intertidal and shallow subtidal (down to 20 m depth) element currently found in sand (MATSUKUMA, 1984; BERNARD et al., 1993).

FOSSIL RECORDS: Holocene of Thailand.

Lioconcha (Lioconcha) fastigiata (Sowerby, 1851)

Pl. 18, fig. 1

1885 *Circe fastigiata* - Smith, p. 146.
1965 *Lioconcha fastigiata* - Kira, p. 162, pl. 58, fig. 1.
1972 *Lioconcha fastigiata* - Cernohorsky, p. 236, pl. 5, fig. 8.
1978 *Lioconcha fastigiata* - Kirtisinghe, p. 33, pl. 16, fig. 1.
1981 *Lioconcha fastigiata* - Eisenbetg, p. 168, pl. 151, figs. 1, 1A.
1986 *Lioconcha fastigiata* - Springsteen & Leobrera, p. 298, pl. 85, fig. 4.
1991 *Lioconcha fastigiata* - Abbott, p. 101, pl. 48, fig. 3.
1992 *Lioconcha (Lioconcha) fastigiata* - Lamprell & Whitehead, n. 546, pl. 69, fig. 546.
1995 *Lioconcha fastigiata* - Kubo & Kurozumi, p. 201, fig. 9.
1996 *Lioconcha fastigiata* - Jansen, p. 48, pl. 4, fig. 195.

Lioconcha fastigiata is featured by 1) ovate-trigonal, subequilateral shell up to 35 mm in length, 2) anterior side oval, rather attenuated, 3) posterior side with roundly angular end, 4) posterior cardinal tooth crenulated, 5) pallial sinus small, 6) outer surface with growth lines; fresh specimens exhibit brown chevron lines on white background.

DISTRIBUTION AND HABITAT. The species ranges from Sri Lanka to Australia and northward to Japan. It dwells in sandy substrates, from the intertidal zone to 20 m depth (BERNARD et al., 1993).

FOSSIL RECORDS: Holocene of Thailand.

Lioconcha (Sulcilioconcha) philippinarum (Hanley, 1844)

Pl. 18, fig. 2

1844c *Cytherea philippinarum* Hanley, p. 110.
1920 *Cytherea molengraaffi* Tesch, p. 103, pl. 139, figs. 273, 274.
1932 *Hysteroconcha (? Lamelliconcha) philippinarum* - Prashad, p. 217, pl. 6, figs. 7-10.
1946 *Meretrix (Amiantis) philippinarum* - Abrard, p. 40, pl. 3, fig. 13.
1968 *Lioconcha (Sulcilioconcha) philippinarum* - Habe, p. 189, pl. 58, fig. 10.
1971 *Lioconcha (Sulcilioconcha) philippinarum* - Shuto, p. 54, pl. 9, figs. 7, 9, 11, 13, 14; text fig. 12 (3-5).
1974 *Lioconcha philippinarum* - Fischer-Piette, p. 288, pl. 3, figs. 24-28.
1982 *Lioconcha (Sulcilioconcha) philippinarum* - Kanno, O'Hara & Caagusan, p. 84, pl. 15, fig. 14.
1984 *Lioconcha (Sulcilioconcha) philippinarum* - Matsukuma, p. 28, pl. 5, fig. 8.
1986 *Lioconcha (Sulcilioconcha) philippinarum* - Sato, Masuda & Shuto, p. 38, pl. 5, fig. 18.
1986 *Pitar (Pitarina) philippinarum* - Springsteen & Leobrera , p. 304, pl. 86, fig. 17.
1992 *Lioconcha philippinarum* - Oliver, p. 186, pl. 40, fig. 4.
1995 *Lioconcha philippinarum* - Kubo & Kurozumi, p. 201, fig. 10.

The species is featured by 1) trigonal-ovate to oval, slightly inequilateral shell attaining 20 mm in length, 2) lunule lanceolate, poorly defined, escoutcheon wanting, 3) hinge pitarine, 4) pallial sinus small, 5) sculpture of even, closely set, flat-topped commarginal cords occasionally bipartite. Young specimens tend to be more trigonal.

DISTRIBUTION AND HABITAT. *Lioconcha philippinarum* ranges from Madagascar to Indonesia, Fiji, Caroline and Marshall Islands and northward to Japan. The species is commonly found in fine sandy bottoms, intertidally and down to 40 m depth (HABE, 1968; BERNARD et al., 1993). It was dredged from a 40 m deep muddy bottom in western Thai waters (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Upper Miocene of the Philippines; Pliocene of Indonesia, Philippines, Japan, New Hebrides and Fiji; Quaternary of Indonesia and Philippines; Holocene of Thailand.

Lioconcha (Sulcilioconcha) sp.

Pl. 18, fig. 3

A few valves were recovered from the Bangkok Clay, the largest 20 mm long. Diagnostic features are 1) shell slightly longer than high, trigonal-ovate in outline, attenuated posteriorly, 2) antero-dorsal margin rather short, concave, 3) postero-dorsal margin somewhat convex, steeply sloping, 4) ventral margin arched, quickly ascending anteriorly, 5) lunule lanceolate, escutcheon wanting, 6) hinge pitarine, 7) pallial sinus very small, 8) sculpture of very coarse commarginal cords separated by deep, narrow grooves. The trigonal outline and coarse sculpture are the most distinctive characters. *Lioconcha annettae* Lamprell & Whitehead, 1990, *Lioconcha fastigiata* (Sowerby, 1851) and *Lioconcha polita* (Röding, 1798) are similarly shaped, but basically unsculptured.

FOSSIL RECORDS: Holocene of Thailand.

Subfamily *Tapetinae*

Irus (Irus) macrophyllus (Deshayes, 1853)

Pl. 18, fig. 4

1906 *Venerupis macrophylla* - Melvill & Standen, p. 836.
1909 *Venerupis irus* - Lynge, p. 252.
1932 *Venerupis macrophylla* - Prashad, p. 263.
1956 *Venerupis macrophylla* - Satyamurti, p. 127, pl. 19, fig. 5.
1961 *Irus macrophyllus* - Hayasaka, p. 51, pl. 5, fig. 8.
1964 *Venerupis (Notirus) macrophylle* (sic) - Spry, p. 34.
1965 *Notirus macrophyllus* - Kira, p. 165, pl. 58, fig. 24.
1968 *Venerupis macrophylla* - Cheriyan, p. 131.
1971 *Irus irus* - Fischer-Piette & Métivier, p. 79 (partim).
1979 *Notirus macrophyllus* - Di Geronimo & Robba, pl. 1, fig. 15.
1992 *Irus macrophylla* - Oliver, p. 190, pl. 44, fig. 1 (*cum syn.*).
1992 *Irus (Irus) irus* - Lamprell & Whitehead, n. 597, pl. 75, fig. 597.
1995 *Irus macrophylla* - Bosch, Dance, Moolenbeek & Oliver, p. 275, fig. 1235.
1995 *Irus macrophylla* - Kubo & Kurozumi, p. 203, fig. 3.

This distinctive species is featured by 1) oblong-ovate to subquadrangular, markedly inequilateral shell attaining 35 mm in length, 2) pallial sinus angular, moderately deep and 3) sculpture of distant commarginal lamellae, more raised posteriorly, and fine radial threads. The closely related *Irus irus* (Linnaeus, 1758) is the Atlantic-Mediterranean counterpart.

DISTRIBUTION AND HABITAT. The species ranges in the Indo-Pacific, from the Red Sea to Japan (BERNARD et al., 1993). It is an intertidal and shallow infralittoral element found in crevices of rocks and corals or nestling in soft rocks (BERNARD et al., 1993; BOSCH et al., 1995). Previous records in the Gulf of Thailand were from hard substrates, occasionally from sand, at depths of from low water mark to 27 m (LYNGE, 1909, sub *Irus irus*).

FOSSIL RECORDS: Quaternary of Japan; Holocene of Thailand.

Marcia hiantina (Lamarck, 1818)

Pl. 18, fig. 5

1909 *Tapes (Hemitapes) hiantinus* - Lynge, p. 238.
1968 *Katelysia (Hemitapes) hiantina* - Habe, p. 193, pl. 59, fig. 16.
1971 *Marcia hiantina* - Fischer-Piette & Métivier, p. 57, pl. 11, figs. 4-9; pl. 12, figs. 1-9 (*cum syn.*).
1980 *Marcia hiantina* - Lam, p. 23, pl. 1, fig. E; pl. 7, fig. A; text-figs. 4 D, 5 B, 6 A.
1982 *Marcia hiantina* - Abbott & Dance, p. 363, fig. in lower mid row, middle.
1982 *Marcia hiantina* - Bosch & Bosch, p. 188, upper mid fig.
1984 *Marcia hiantina* - Sharabati, pl. 49, figs. 7-7c.
1986 *Katelysia hiantina* - Springsteen & Leobrera, p. 297, pl. 85, fig. 1.
1989 *Marcia hiantina* - Bosch & Bosch, p. 93, bottom fig.
1992 *Marcia hiantina* - Dharma, p. 96, pl. 26, fig. 16.
1992 *Marcia (Hemitapes) hiantina* - Lamprell & Whitehead, n. 602, 603, pl. 75, figs. 602, 603.

Marcia hiantina is featured by 1) ovate-quadrangular, inequilateral shell attaining 50 mm in length, 2) anterior side oval, attenuated, 3) posterior side obliquely subtruncate, its outline with a distinct postero-dorsal angle, 4) pallial sinus ascending, moderately deep, 5) sculpture of closely set commarginal cords changing into well spaced low ridges over the posterior part.

DISTRIBUTION AND HABITAT. The species ranges in the Indo-Pacific, from the Red Sea to Queensland and northward to Japan (FISCHER-PIETTE & MÉTIVIER, 1971). It is reported to dwell in mud and sand, from the intertidal zone down to 20 m depth (BERNARD et al., 1993). According to PURCHON & PURCHON (1981), *Marcia hiantina* occurs in intertidal sands and seaward of the mangrove forest in the coastal area of Singapore.

FOSSIL RECORDS: Quaternary of Indonesia; Holocene of Thailand.

Marcia recens (Dillwyn, 1817)

Pl. 18, fig. 6

1885 *Tapes (Pullastra) marmorata* - Martin, p. 205, pl. 11, fig. 206.
1971 *Marcia recens* - Fischer-Piette & Métivier, p. 61 (*cum syn.*).
1973 *Katelysia marmorata* - Biggs, p. 402.
1980 *Marcia marmorata* - Lam, p. 23, pl. 1, fig. G; pl. 7, fig. C; text figs. 4 F, 5 A.
1982 *Marcia* sp. Bosch & Bosch, p. 189, top fig.
1995 *Marcia marmorata* - Bosch, Dance, Moolenbeek & Oliver, p. 272, fig. 1224.

Marcia recens is characterized by 1) oval, inequilateral, robust shell up to 55 mm in length, 2) beaks at the anterior one-third, 3) sculpture rather coarse, of commarginal cords that tend to fade away over the middle part. On the basis of this latter feature, the Thai specimens conform to *Venus marmorata* Lamarck, 1818 which is currently regarded as a synonym of the present species. *Marcia recens* differs from *Marcia hiantina* (Lamarck, 1818) in having oval shell devoid of postero-dorsal angulation.

DISTRIBUTION AND HABITAT. The species is widely distributed in the Indo-Pacific, from the Persian Gulf to Australia and northward to Japan (FISCHER-PIETTE & MÉTIVIER, 1971). It is an intertidal and infralittoral element dwelling in sand, sandy mud and mud (LAM, 1980; BERNARD et al., 1993; BOSCH et al., 1995).

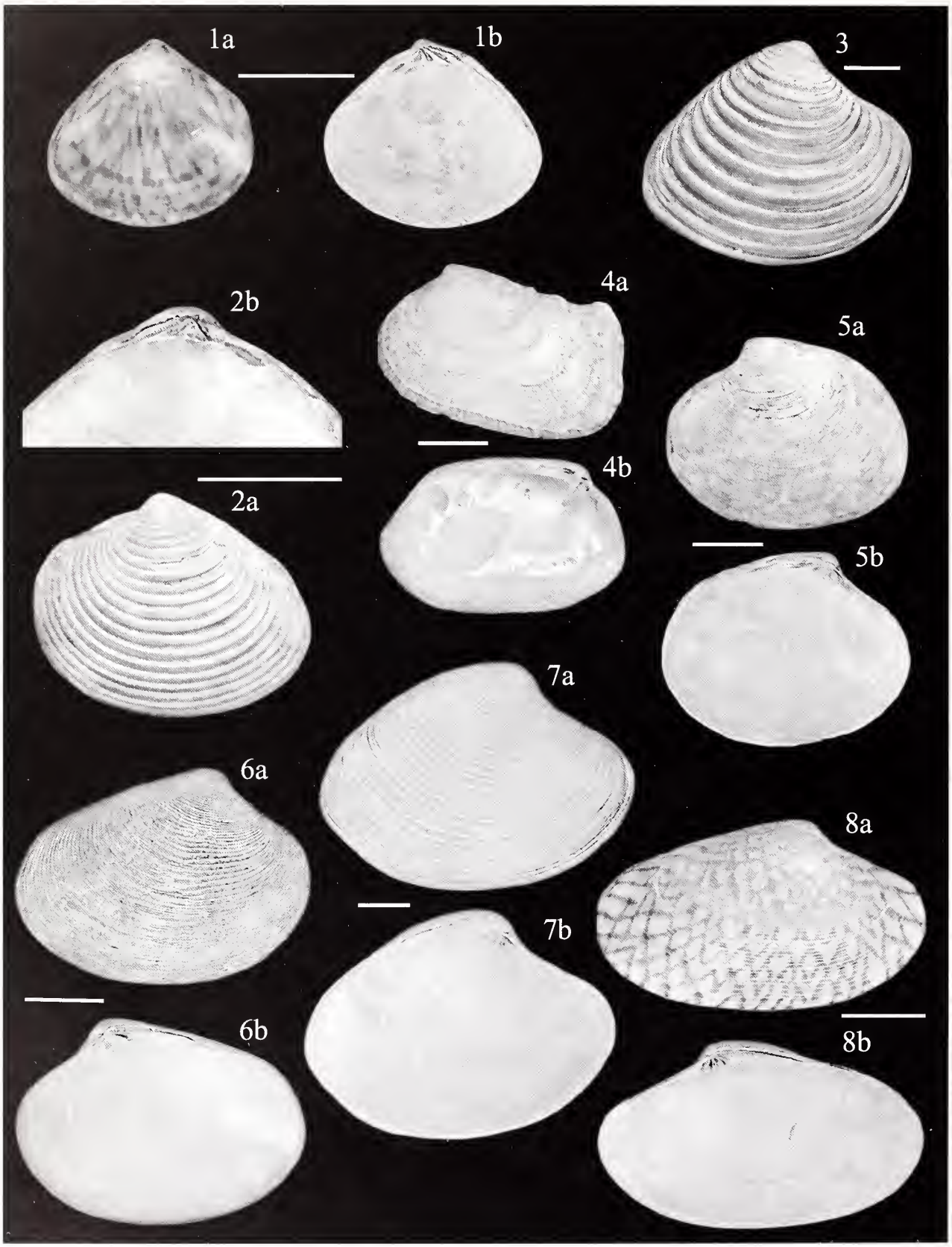

Plate 18: Figs. 1a, 1b. *Lioconcha (Lioconcha) fastigiata* (Sowerby, 1851), Station TH 25; scale bar 5 mm. Figs. 2a, 2b. *Lioconcha (Sulciliioconcha) philippinarum* (Hanley, 1844), Ratchaburi, sample RAT1, Holocene; scale bar 5 mm. Fig. 3. *Lioconcha (Sulciliioconcha)* sp., Ratchaburi, sample RAT1, Holocene; scale bar 5 mm. Figs. 4a, 4b. *Irus (Irus) macrophyllus* (Deshayes, 1853), Station TH 57; scale bar 2 mm. Figs. 5a, 5b. *Marcia hiantina* (Lamarck, 1818), Station TH 68; scale bar 2 mm. Figs. 6a, 6b. *Marcia recens* (Dillwyn, 1817), Station TH 8; scale bar 10 mm. Figs. 7a, 7b. *Paphia (Protapes) gallus* (Gmelin, 1791), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 8a, 8b. *Paphia (Paphia) undulata* (Born, 1778), Station TH 12; scale bar 10 mm.

FOSSIL RECORDS: Upper Miocene to Quaternary of Indonesia; Holocene of Thailand.

Paphia (Paphia) undulata (Born, 1778)

Pl. 18, fig. 8

1885 *Tapes (Paratapes) undulata* - Smith, p. 115.
1909 *Tapes (Paratapes) undulatus* - Lynge, p. 237.
1932 *Paphia (Paratapes) undulata* - Prashad, p. 240 (*cum syn.*).
1957 *Paphia (Paratapes) undulata* - Makiyama, pl. 20, fig. 1.
1960 *Paphia (Paratapes) undulata* - Makiyama, pl. 94, fig. 2.
1961 *Paphia (Paratapes) undulata* - Hayasaka, p. 50, pl. 5, fig. 10.
1965 *Paphia (Neotapes) undulata* - Kira, p. 161, pl. 57, fig. 24.
1969 *Paphia undulata* - Treatise I. P., fig. 59 (1).
1971 *Paphia undulata* - Fischer-Piette & Metivier, p. 50.
1971 *Paphia (Neotapes) undulata* - Kuroda, Habe & Oyama, p. 425, pl. 92, fig. 4.
1977 *Paphia (Neotapes) undulata* - Habe, p. 265, pl. 54, figs. 8, 9.
1981 *Paphia undulata* - Eisenberg, pl. 151, fig. 14.
1982 *Paphia undulata* - Abbott & Dance, p. 364, fig. in lower mid row, left.
1984 *Paphia undulata* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 2, fig. 13.
1991 *Paphia undulata* - Abbott, p. 102, pl. 48, fig. 5.
1991 *Paphia (Neotapes) undulata* - Tsuchida, Hori & Mitoki, p. 3, pl. 3, fig. 11.
1992 *Paphia undulata* - Dharma, p. 96, pl. 26, fig. 14.
1992 *Paphia undulata* - Oliver, p. 191, pl. 43, fig. 6 (*cum syn.*).
1992 *Paphia (Paphia) undulata* - Lamprell & Whitehead, n. 605, pl. 76, fig. 605.
1994 *Paphia undulata* - Scott, p. 83, pl. 11, fig. B.
1995 *Paphia undulata* - Bosch, Dance, Moolenbeek & Oliver, p. 273, fig. 1227.

This is a distinctive species readily recognized by 1) elongate-oval, inequilateral shell up to 50 mm in length, 2) pallial sinus rectangular, ascending, moderately deep, 3) outer surface with growth lines and slightly oblique, somewhat undulating commarginal grooves; fresh specimens exhibit brown chevron pattern on very pale brown background.

DISTRIBUTION AND HABITAT. The species is widely distributed in the tropical Indo-Pacific, from the Red Sea to Australia and northward to Japan. *Paphia undulata* is reported to dwell muddy substrates in the intertidal zone and down to 50 m (KURODA et al., 1971; BERNARD et al., 1993). On the west coasts of Malaya and Thailand it occurs in muddy bottoms at and below low water mark of neap tides (TANTANASIRIWONG, 1979; PURCHON & PURCHON, 1981). In the Gulf of Thailand, it was recovered in very large numbers from muddy substrates 5-35 m deep (LYNGE, 1909). According to HORIKOSHI & THOMPSON (1980), *Paphia undulata* is an indicator species for bay head conditions or strong embayment degree.

FOSSIL RECORDS: Upper Miocene of Indonesia and Japan; Pliocene of Indonesia, Philippines, Taiwan and Japan; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Paphia(Protapes) gallus (Gmelin, 1791)

Pl. 18, fig. 7

1909 *Tapes (Protapes) malabaricus* - Lynge, p. 141.
1909 *Tapes (Protapes) sinuosus* - Lynge, p. 142.
1932 *Paphia (Protapes) sinuosa* - Prashad, p. 237.
1939 *Venus malabarica* - Lamy & Fischer-Piette, p. 315.
1971 *Paphia malabarica* - Fischer-Piette & Métivier, p. 39, pl. 9, figs. 7-10 (*cum syn.*).
1971 *Paphia (Protapes) malabaricas* (sic) - Freneix, Karche & Salvat, p. 15, pl. C, fig. 2.
1974 *Paphia malabarica* - Fischer Piette, p. 297.
1978 *Paphia malabarica* - Kirtisinghe, p. 33, pl. 16, fig. 3.
1979 *Paphia gallus* - Tantanasiriwong, p. 13.
1982 *Paphia gallus* - Bosch & Bosch, p. 190, bottom fig.
1982 *Paphia gallus* - Abbott & Dance, p. 363, fig. in top row, right.
1988 *Paphia (Protapes) gallus* - Matsukuma, Ozawa & Yoosukh, p. 412, pl. 2, fig. 5; text-figs. 6, 11, 12.
1988 *Paphia (Protapes) sinuosa* - Matsukuma, Ozawa & Yoosukh, p. 413, pl. 2, figs. 3, 4; text-figs. 7-10.
1989 *Paphia gallus* - Bosch & Bosch, p. 94, bottom fig.
1992 *Paphia (Protapes) gallus* - Oliver, p. 191, pl. 43, fig. 7.
1992 *Paphia (Protapes) gallus* - Lamprell & Whitehead, n. 608, pl. 76, fig. 608.
1994 *Paphia gallus* - Scott, p. 83, pl. 11, fig. A.
1995 *Protapes sinuosa* - Bosch, Dance, Moolenbeek & Oliver, p. 273, fig. 1229.
1996 *Paphia (Protapes) gallus* - Oliver & Glover, p. 397, pl. 2, figs. 3-5; text-fig. 5.

Paphia gallus is featured by 1) ovate shell attaining 65 mm in lenght, 2) ascending, deep pallial sinus and 3) sculpture of more or less coarse commarginal ridges. The sculpture is of variable strength, changing from broad and flat to narrower, more raised and somewhat upturned ridges which may continue over the lunule or fade at its margin. *Venus sinuosa* Lamarck, 1818 is currently regarded as a synonym of the present species.

DISTRIBUTION AND HABITAT. The species ranges in the tropical Indo-Pacific, from Aden to Torres Strait and northward to South China Sea (BERNARD et al., 1993). It is reported to be a common intertidal (ABBOTT & DANCE, 1982) and infralittoral element dwelling in sand and mud (BERNARD et al., 1993). In western Thai waters, *Paphia gallus* was noted to occur on mud flats below low water mark and down to 20 m depth (TANTANASIRIWONG, 1979). In the Gulf of Thailand it was recovered from different substrates in the upper infralittoral zone; specimens conforming to *Venus sinuosa* were obtained from shelly bottoms (LYNGE, 1909).

FOSSIL RECORDS: undetermined Miocene of Indonesia; Pliocene of Madagascar and Mozambique; Quaternary of Japan; Holocene of Thailand.

Subfamily *Dosiniinae*

Dosinia cretacea (Reeve, 1850)

Pl. 19, fig. 1, 7

1879 *Dosinia cretacea* - Woodward, p. 390, pl. 10, fig. 8.
1922 *Dosinia cretacea* - Dickerson, pl. 6, fig. 14.
1956 *Dosinia cretacea* - Satyamurti, p. 118, pl. 17, fig. 5.
1967 *Dosinia (Asa) cretacea* - Fischer-Piette & Delmas, p. 41, pl. 9, figs. 6-21 (*cum syn.*).
1968 *Dosinia cretacea* - Cheriyan, p. 129.
1978 *Dosinia cretacea* - Kirtisinghe, p. 31, pl. 15, fig. 3.

The species is featured by 1) suborbicular, inequilateral shell up to 35 mm in length, 2) beaks rather prominent, about at the anterior one-third, 3) postero-dorsal margin long, slightly convex, forming an obtuse angle with the posterior margin, 4) lunule small, sunken, 5) pallial sinus deep, very narrow, finger-like, 6) outer surface with fine commarginal threads, somewhat lamellose toward the border of lunule and escutcheon.

DISTRIBUTION AND HABITAT. *Dosinia cretacea* ranges from the Red Sea to Indonesia and the Philippines. It was recovered from very broad sheltered sand on the east coast of Malaya and from mangrove with a river mouth on the north coast of Singapore (PURCHON & PURCHON, 1981).

FOSSIL RECORDS: Middle and Upper Miocene of Indonesia; Pliocene of Indonesia and Philippines; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Dosinia dautzenbergi Fischer-Piette & Delmas, 1967

Pl. 19, fig. 2

1967 *Dosinia (Asa) dautzenbergi* Fischer-Piette & Delmas, p. 26, pl. 5, figs. 11-15.

Diagnostic features are 1) suborbicular, inequilateral shell attaining 30 mm in length, 2) antero-dorsal margin very short, distinctly

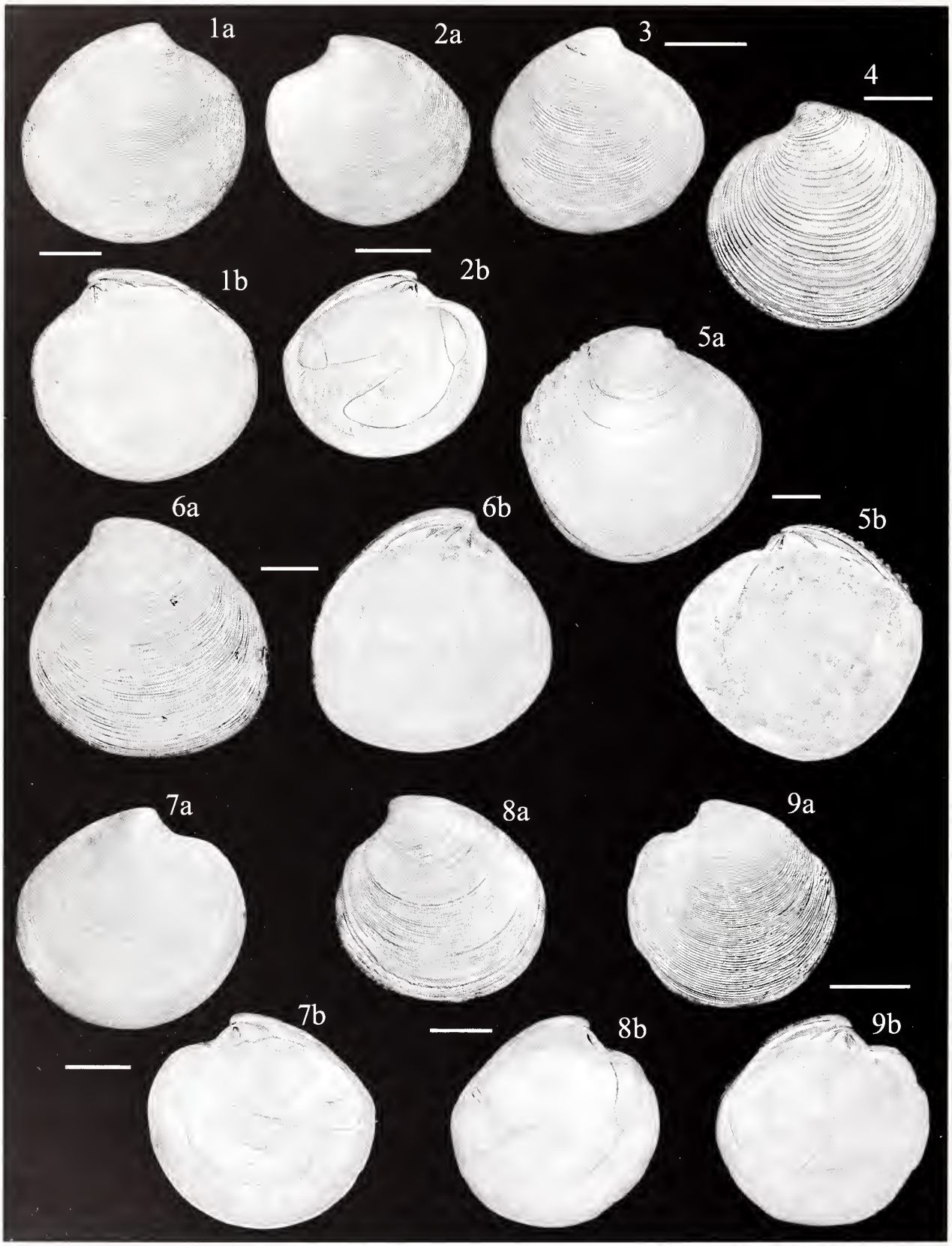

Plate 19: Figs. 1a, 1b. *Dosinia cretacea* (Reeve, 1850), Locality TH 33, level C, Holocene, scale bar 10 mm. Figs. 2a, 2b. *Dosinia dautzenbergi* Fischer-Piette & Delmas, 1967, Ban Tak Daet, sample BTD4, Holocene; scale bar 10 mm. Fig. 3. *Dosinia derupta* Römer, 1860, Station TH 56; scale bar 10 mm. Fig. 4. *Dosinia dilecta* Adams, 1855, Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 10 mm. Figs. 5a, 5b. *Dosinia trailli* Adams, 1855, Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 10 mm. Figs. 6a, 6b. *Dosinia trigona* (Reeve, 1850), Ban Tak Daet, sample BTD2, Holocene; scale bar 10 mm. Figs. 7a, 7b. *Dosinia cretacea* (Reeve, 1850), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 8a, 8b. *Dosinia tumida* (Gray, 1838), sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 9a, 9b. *Dosinia tumida* (Gray, 1838), Station TH 78; scale bar 10 mm.

concave, 3) postero-dorsal margin long, gently convex, 4) ventral margin following a semicircular course, 5) lunule cordate, small, sunken, more so anteriorly, 6) pallial sinus deep, somewhat narrower in the left valve, with rounded tip at the level of beaks, 7) outer surface with crowded, fine commarginal threads, somewhat lamellose toward the border of lunule and escutcheon.

DISTRIBUTION AND HABITAT. The species ranges from Indonesia to Vietnam. There is no information about its ecological requirements.

FOSSIL RECORDS: Holocene of Thailand.

Dosinia derupta Römer, 1860

Pl. 19, fig. 3

1967 *Dosinia (Sinodia) derupta* - Fischer-Piette & Delmas, p. 7 pl. 1, figs. 11-23.

Dosinia derupta is a poorly known species featured by 1) suborbicular, inequilateral shell up to 30 mm in length, 2) anterior part rather tapering, 3) posterior part wider, with weakly biangulated outline, 4) lunule large, clearly demarcated, nearly extending to the anterior edge of shell, 5) antero-dorsal margin sloping, gently convex, 6) hinge robust, with well developed anterior laterals, 7) pallial sinus narrow, upward directed, reaching the level of beaks, with subangular upper border in left valve, 8) outer surface with even, closely set commarginal low cords, thinner on postero-dorsal slope. *Dosinia gibba* Adams, 1869 is closely related, but is rounded posteriorly and more coarsely sculptured.

DISTRIBUTION AND HABITAT. The species ranges from Pakistan to China Sea. According to BERNARD et al. (1993), it dwells in sand and mud, intertidally and down to 20 m depth.

FOSSIL RECORDS: none recorded.

Dosinia dilecta Adams, 1855

Pl. 19, fig. 4

1855 *Dosinia dilecta* Adams, p. 224.
1909 *Dosinia dilecta* - Lynge, p. 249, pl. 5, fig. 11-13.
1967 *Dosinia (Dosinella) dilecta* - Fischer-Piette & Delmas, p. 77, pl. 14, fig. 1-3.
1984 *Dosinia (Dosinella) dilecta* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 2, figs. 9-12.

Diagnostic features are 1) orbicular, subequilateral, rather thin shell up to 40 mm in length, 2) lunule deeply demarcated, exceedingly small, 3) escutcheon very narrow, steeply sloping toward the dorsal margin, 4) pallial sinus deep, rather narrow, extending somewhat beyond the beaks, 5) sculpture of rather widely spaced, even and low commarginal lamellae.

DISTRIBUTION AND HABITAT. The species ranges from the Andaman Sea to Indonesia and the Gulf of Thailand. It has been recorded on the west coast of Malaya, from coarse loose sand at low water mark in sheltered bays (PURCHON & PURCHON, 1981). Previous records in the Gulf of Thailand were from soft mud, at a depth of about 10 m (LYNGE, 1909).

FOSSIL RECORDS: Holocene of Thailand.

Dosinia trailli Adams, 1855

Pl. 19, fig. 5

1855 *Dosinia traillii* Adams, p. 223.
1967 *Dosinia (Dosinella) trailli* - Fischer-Piette & Delmas, p. 75, pl. 13, figs. 4-12.
1984 *Dosinia (Dosinella) trailli* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 3, figs. 2, 3.

The species is recognized by 1) roundly quadrangular, inequilateral shell up to 55 mm in length, 2) lunule small, shield-shaped, 3) anterior side attenuated, 4) pallial sinus wide and deep, large for the genus, extending beyond mid-length, 5) sculpture of commarginal cords, stronger anteriorly and posteriorly, raised at the border of the escutcheon to form a crested ridge; some radial lines are also noted on middle part. *Dosinia corrugata* (Reeve, 1850) is the most closely related species and is regarded as a senior synonym of *Dosinia trailli* by some authors. According to the illustrations of the type material published by FISCHER-PIETTE & DELMAS (1967), *Dosinia corrugata* appears to have more convex shell, somewhat ovate outline, narrower and deeper pallial sinus.

DISTRIBUTION AND HABITAT. *Dosinia trailli* ranges from Indonesia to Japan. Likely, it is an intertidal element.

FOSSIL RECORDS: Holocene of Thailand.

Dosinia trigona (Reeve, 1850)

Pl. 19, fig. 6

1909 *Dosinia trigona* - Lynge, p. 248.
1956 *Dosinia trigona* - Satyamurti, p. 118, pl. 17, fig. 6.
1967 *Dosinia (Sinodia) trigona* - Fischer-Piette & Delmas, p. 4, pl. 1, figs. 1, 2.
1968 *Dosinia trigona* - Cheriyan, p. 129.
Not 1978 *Dosinia trigona* - Kirtisinghe, p. 31, pl. 15, fig. 2.

Distinctive features are 1) subtrigonal, inequilateral, slightly higher than long, rather inflated, thick shell up to 40 mm in length, 2) antero-dorsal margin nearly straight, very steep, 3) postero-dorsal margin convex, 4) ventral margin of Thai specimens more convex than in type material, 5) lunule large, lanceolate, poorly defined, 6) pallial sinus subangular, moderately deep, 7) sculpture of closely set commarginal cords.

DISTRIBUTION AND HABITAT. *Dosinia trigona* occurs uncommonly from India to Southeast Asia. The species was recovered from intertidal sands and rocks and mangroves on the west coast of Malaya (MORRIS & PURCHON, 1981). Previous records in the Gulf of Thailand were at Koh Chang, from the strand off the mangrove forest (LYNGE, 1909).

FOSSIL RECORDS: Holocene of Thailand.

Dosinia tumida (Gray, 1838)

Pl. 19, figs. 8, 9

1847 *Cytherea (Artemis) pubescens* Philippi, p. 36, pl. 8, fig. 3.
1909 *Dosinia pubescens* - Lynge, p. 251.
1914 *Dosinia tumida* - Hedley, p. 268.
1960 *Dosinia (Phacosoma) japonica* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 142, fig. 117.
1960 *Dosinia japonica* - Paes da Franca, p. 96, pl. 27, fig. 2.
1961 *Dosinia (Phacosoma) troscheli* - Hayasaka, p. 45, pl. 5, fig. 4.
1965 *Dosinorbis (Phacosoma) japonica* - Kira, p. 159, pl. 57, fig. 7.
1967 *Dosinia (Asa) tumida* - Fischer-Piette & Delmas, p. 37, pl. 8, figs. 12-17 (*cum syn.*).
1967 *Dosinia (Asa) tumida* var. *troscheli* - Fischer-Piette & Delmas, p. 40.
1967 *Dosinia (Asa) tumida* var. *biscocta* - Fischer-Piette & Delmas, p. 40, pl. 8, figs. 15-17.
1968 *Dosinia tumida* - Boshoff & Field, p. 89.
1968 *Dosinia (Phacosoma) biscocta* - Habe, p. 189, pl. 58, fig. 16.
1971 *Dosinorbis (Phacosoma) troscheli* - Kuroda, Habe & Oyama, p. 420, pl. 91, figs. 3, 4.
1971 *Dosinorbis (Phacosoma) japonica* - Kuroda, Habe & Oyama, p. 421, pl. 91, fig. 1.
1971 *Dosinorbis (Phacosoma) biscoctus* - Kuroda, Habe & Oyama, p. 421, pl. 90, fig. 7.
1974 *Dosinia (Asa) tumida* - Fischer Piette, p. 292.
1977 *Phacosoma japonicum* - Habe, p. 260, pl. 55, fig. 1.
1977 *Phacosoma troscheli* - Habe, p. 260, pl. 54, fig. 5.
1978 *Dosinia biscocta* - Kirtisinghe, p. 32, pl. 15, fig. 4.

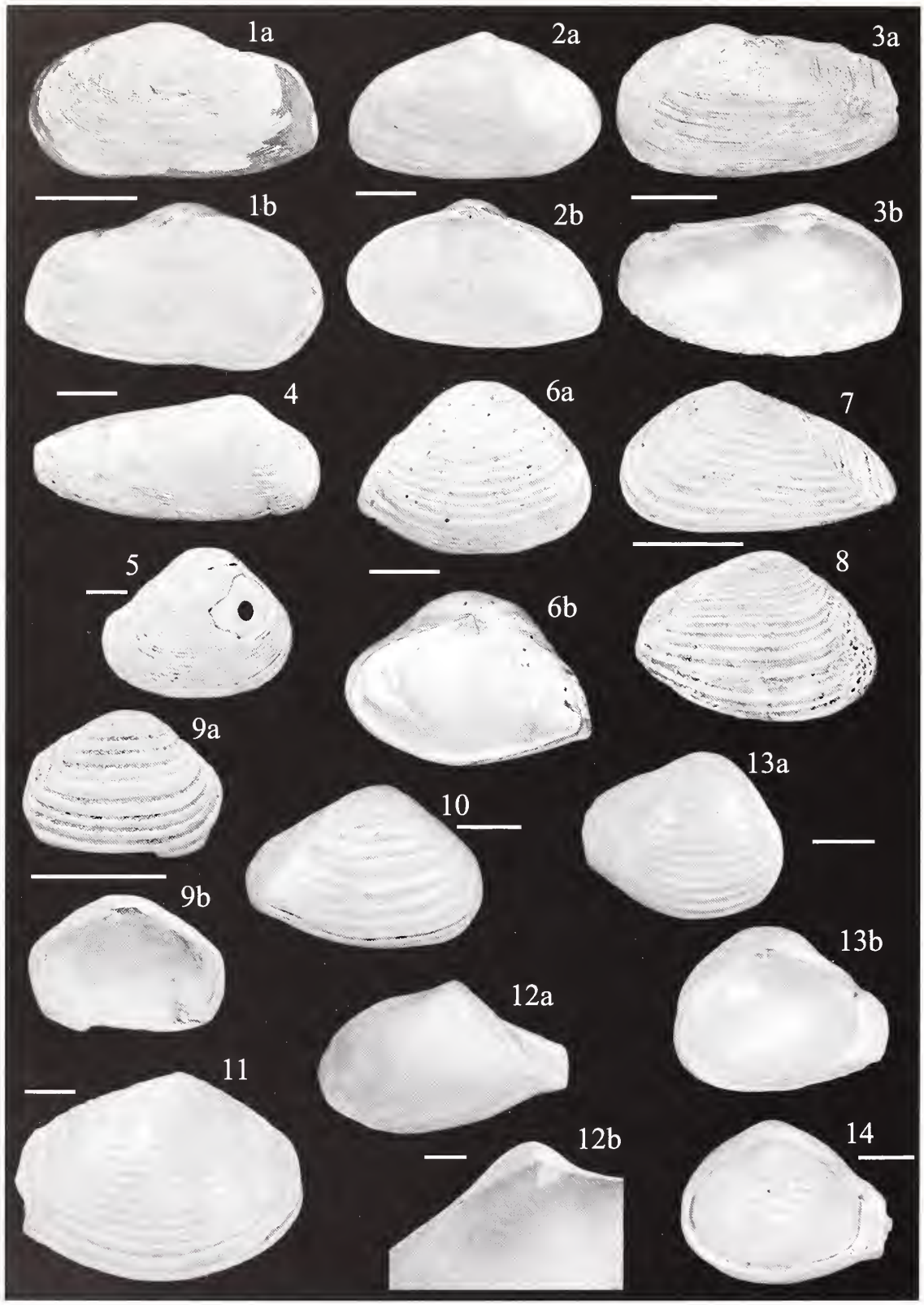

Plate 20: Figs. 1a, 1b. *Glauconome chinensis* Gray, 1828, Station TH 115; scale bar 5 mm. Figs. 2a, 2b. *Glauconome* sp., Locality TH 33, level B, Holocene; scale bar 2 mm. Figs. 3a, 3b. *Sphenia perversa* Blanford, 1867, Station TH 11; scale bar 3 mm. Fig. 4. *Sphenia perversa* Blanford, 1867, Station TH 11; scale bar 2 mm. Fig. 5. *Corbula (Corbula) fortisulcata* (Smith, 1878), Ban Tak Daet, sample BTD4, Holocene; scale bar 2 mm. Figs. 6a, 6b. *Corbula (Corbula) scaphoides* Hinds, 1843, Station TH 108; scale bar 5 mm. Fig. 7. *Corbula (Anisocorbula) crassa* Reeve, 1843, Station TH 15; scale bar 5 mm. Fig. 8. *Corbula (Anisocorbula) crassa* Reeve, 1843, Station TH 15; scale bar 5 mm. Figs. 9a, 9b. *Corbula (Anisocorbula) modesta* Hinds, 1843, Station TH 108; scale bar 5 mm. Fig. 10. *Corbula (Anisocorbula) solidula* Hinds, 1843, Station TH 55; scale bar 1 mm. Fig. 11. *Corbula (Anisocorbula)* sp., Station TH 103; scale bar 5 mm. Figs. 12a, 12b. *Corbula (Caryocorbula) lineata* Lynge, 1909, Station TH 75; scale bar 1 mm. Figs. 13a, 13b. *Corbula (Notocorbula) monilis* Hinds, 1843, Station TH 56; scale bar 1 mm. Fig. 14. *Corbula (Notocorbula) monilis* Hinds, 1843, Station TH 78; scale bar 1 mm.

1980 *Dosinia japonica* - Volova & Scarlato, p. 57, fig. 51.
1982 *Dosinia japonica* - Abbott & Dance, p. 361, fig. in top row, left.
1982 *Dosinia troscheli* - Abbott & Dance, p. 361, fig. in top row, middle.
1982 *Dosinia tumida* - Bosch & Bosch, p. 187, mid lower fig.
1983 *Dosinia (Phacosoma) japonica* - Masuda, Hayasaka & Noda, p. 20, pl. 4, fig. 12.
1986 *Dosinia (Phacosoma) troscheli* - Springsteen & Leobrera, p. 304, pl. 86, fig. 15.
1986 *Dosinia (Phacosoma) japonica* - Takayasu, pl. 75, fig. 3; pl. 82, figs. 12, 14.
1988 *Dosinia (Phacosoma) japonica* - Yoon, pl. 1, fig. 33.
1988 *Dosinorbis (Phacosoma) japonicus* - Matsukuma, Ozawa & Yoosukh, pl. 4, fig. 5.
1989 *Dosinia tumida* - Bosch & Bosch, p. 93, top lower fig.
1989 *Phacosoma japonicum* - Ito, p. 65, pl. 27, fig. 2.
1990 *Dosinia (Phacosoma) japonica* - Masuda, Handa, Kanno, Miyasaka, Nemoto, Sasaki, Takaizumi & Wako, pl. 2, fig. 8; pl. 3, figs. 3-5.
1992 *Dosinia pubescens* - Oliver, p. 187, pl. 42, fig. 5.
1992 *Dosinia tumida* - Lamprell & Whitehead, n. 560, pl. 71, fig. 560.
1995 *Dosinia tumida* - Bosch, Dance, Moolebeek & Oliver, p. 272, fig. 1223.

Dosinia tumida is featured by 1) orbicular to roundly quadrangular, inequilateral shell up to 65 mm in length, this latter dimension equal to height or slightly greater, 2) beaks at the anterior one-third, 3) antero-dorsal margin very short, distinctly concave, postero-dorsal margin long, slightly convex, both forming an obtuse angle with the broadly arched ventral margin, 4) lunule small, shield-like, 5) escutcheon bounded by a crested ridge, 6) pallial sinus angular, moderately deep, extending to the level of the posterior cardinal tooth, 7) sculpture of dense commarginal fine cords changing into rather raised lamelle toward the exteremities. *Dosinia tumida* is a variable species as regards both the shape and the sculpture. It is treated herein following Fischer-Piette & Delmas (1967).

Distribution and Habitat. The species is widely distributed in the Indo-Pacific (Fischer-Piette & Delmas, 1967). According to Bernard et al. (1993), it occurs in sand and mud, intertidally and down to 100 m depth. Previous records in the Gulf of Thailand were from infralittoral sand and mud (Lynge, 1909, sub *Dosinia pubescens*).

Fossil records: Middle Miocene of Indonesia; Late Miocene of Indonesia and Japan; Pliocene of Japan and Korea; Quaternary of Japan; Holocene of Thailand.

Family *Glauconomidae*

Glauconome chinensis Gray, 1828

Pl. 20, fig. 1

1852 *Glauconome chinensis* - Sowerby, pl. 3, fig. 64.
Not 1960 *Glauconya chinensis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 214, fig. 178.
1965 *Glauconome chinensis* - Kira, p. 169, pl. 59, fig. 16.
1969 *Glauconome chinensis* - Treatise I. P., p. N690, fig. E 152 (2).
1971 *Glauconome chinensis* - Kuroda, Habe & Oyama, p. 434, pl. 102, fig. 4.
1977 *Glauconome chinensis* - Habe, p. 277, pl. 59, figs. 16, 17.
1995 *Glauconome chinensis* - Kubo & Kurozumi, p. 195, fig. 8.

The species is featured by 1) elongated, ovate-subquadrangular, inequilateral, thin shell attaining 25 mm in length, 2) anterior side ovate, 3) posterior side tapering, obliquely subtruncate, 4) hinge with 3 cardinal teeth in each valve, 5) pallial sinus moderately ascending, deep and relatively narrow, with parallel sides, extending to the level of beaks, 6) outer surface with coarse, uneven growth markings; fresh specimens have a olive-green periostracum. The Thai specimens conform to the illustrations of the species published by Japanese authors.

Distribution and Habitat. *Glauconome chinensis* ranges is reported to range in South and East China Sea. It is an intertidal element dwelling in mud (Bernard et al., 1993). Brandt (1974) reported on the presence of *Glauconome* species in Thai mangrove forest and *Nipa* swamps.

Fossil records: none recorded.

Glauconome sp.

Pl. 20, fig. 2

The present unidentified species is represented by a few juvenile fossil specimens. It differs from *Glauconome chinensis* Gray, 1828 in that has more attenuated, rather pointed posterior side.

Fossil records: Holocene of Thailand.

Superfamily Myoidea

Family *Myidae*

Subfamily *Cryptomyinae*

Cryptomya (Venatomya) sp.

The present unidentified species is featured by 1) elongate-ovate, moderately inequilateral, rather inflated, thin shell attaining 23 mm in length, 2) anterior side oval, 3) posterior side attenuated, with short oblique truncation, 4) posterior part of the ventral margin nearly straight, ascending, 5) chondrophore perpendicular to commissure in left valve, 6) pallial sinus wide and exceedingly shallow, 7) outer surface with uneven commarginal growth lines over the anterior one-third, dense, fine radial riblets, somewhat stronger posteriorly, on the mid-posterior part except for the postero-dorsal area that bears only coarse growth markings; a granulose microsculpture is noted over the unribbed anterior part. The Thai specimens appear to be closely related to the Australian shell referred to as *Cryptomya (Venatomya)* sp. by Lamprell & Healy (1998, fig. 552) and may prove to be conspecific.

Fossil records: Holocene of Thailand.

Sphenia perversa Blanford, 1867

Pl. 20, figs. 3, 4

1909 *Sphenia perversa* - Lynge, p. 273.

The species is featured by 1) elongate, ovate-subquadrangular, markedly inequivalve, inequilateral shell attaining 11 mm in length, 2) right valve larger than the left one, both with vertically truncated posterior side, 3) chondrophore present in left valve, 4) pallial sinus deep and wide, subquadrangular, 5) outer surface with coarse, uneven growth markings. *Sphenia coreanica* Habe, 1951 appears to be the most closely related species, hardly distinguishable from *Sphenia perversa*.

Distribution and Habitat. *Sphenia perversa* occurs in the Andaman Sea and southeast Asian waters. Previous records in the Gulf of Thailand were from coarse sand, shells and coral rubble, from low tide mark to about 70 m depth (Lynge, 1909). *Sphenia* species are reported to be nestlers in holes and crevices in shallow water.

Fossil records: none recorded.

Family *Corbulidae*

Subfamily *Corbulinae*

Corbula (Corbula) fortisulcata (Smith, 1878)

Pl. 20, fig. 5

1909 *Corbula sulcata* - Lynge, p. 270.
1940 *Corbula fortisulcata* - Lamy, p. 22.

1968 *Corbula fortisulcata* - Habe, p. 204, pl. 63, fig. 6.
1977 *Corbula fortisulcata* - Habe, p. 281, pl. 59, figs. 5, 6.
1978 *Corbula fortisulcata* - Popenoe & Kleinpell, pl. 16, figs. 190-192.
1982 *Corbula fortisulcata* - Kanno, O'Hara & Caagusan, p. 90, pl. 16, fig. 10.
1998 *Corbula (Notocorbula) fortisulcata* - Lamprell & Healy, p. 192, fig. 559.

Corbula fortisulcata is featured by 1) trigonal-ovate, inequivalve and inequilateral, thick shell up to 19 mm in length, 2) posterior end produced and rostrate, 3) right valve sculptured with very coarse, rounded commarginal cords, 4) left valve with commarginal cords, strong over the umbonal area, markedly weaker over the rest of the surface, and with 6-7 middle faint radial riblets.

DISTRIBUTION AND HABITAT. The species is distributed in the Southwest Pacific, reaching as far north as Taiwan. *Corbula fortisulcata* is reported to dwell in fine sandy and muddy substrates, from the intertidal zone to 70 m depth (HABE, 1968; BERNARD et al., 1993). Previous records in the Gulf of Thailand were from muddy or shelly bottoms 15-30 m deep (LYNGE, 1909, sub *Corbula sulcata*).

FOSSIL RECORDS: Upper Miocene and Pliocene of the Philippines; Holocene of Thailand.

Corbula (Corbula) scaphoides Hinds, 1843
Pl. 20, fig. 6

1843a *Corbula scaphoides* Hinds, p. 56.
1885 *Corbula scaphoides* - Smith, p. 32, pl. 7, figs. 3-3b.
1885 *Corbula scaphoides* - Martin, p. 196, pl. 10, fig. 199.
1909 *Corbula (Aloidis) tunicata* - Lynge, p. 266.
1922 *Corbula scaphoides* - Dickerson, pl. 6, fig. 13.
1924 *Corbula scaphoides* - Cossmann, p. 149, pl. 8, figs. 27-29, 34.
1941 *Corbula scaphoides* - Lamy, p. 24.
1960 *Corbula tosana* - Makiyama, pl. 115, fig. 1.
? 1968 *Anisocorbula scaphoides* - Habe, p. 204, pl. 63, fig. 1.
1971 *Corbula (Corbula) scaphoides* - Shuto, p. 66, pl. 10, figs. 1, 3-6, 10, 17; text-fig. 14 (1-4).
? 1971 *Anisocorbula scaphoides* - Kuroda, Habe & Oyama, p. 465, pl. 102, fig. 13 .
? 1977 *Anisocorbula scaphoides* - Habe, p. 281, pl. 59, fig. 7.
1986 *Anisocorbula tosana* - Sato, Masuda & Shuto, p. 43, pl. 5, figs. 20-22.
? 1989 *Anisocorbula scaphoides* - Ito, p. 65, pl. 27, fig. 8.
? 1991 *Anisocorbula* cf. *tosana* Noda, p. 31, fig. 11 (16).
? 1993 *Anisocorbula scaphoides* - Noda, Kikuchi & Nikaido, p. 164, fig. 22 (16-19).
? 1995 *Anisocorbula scaphoides* - Noda, Watanabe & Kikuchi, p. 68, fig. 8 (4).

The Thai specimen conforms to the figures of *Corbula scaphoides* published by SMITH (1885) and SHUTO (1971). The species has 1) ovate-trigonal shell up to 25 mm in lenght, 2) swollen beak, 3) weak umbonal ridge and 4) strong commarginal ridges. *Corbula tunicata* Hinds, 1843 is a related species differing mainly in that has a more elongate shell. *Corbula tosana* Yokoyama, 1928 is currently regarded as a synonym.

DISTRIBUTION AND HABITAT. *Corbula scaphoides* is distributed in the Indo-Pacific, from Andaman Sea to Australia and northward to Japan. According to BERNARD et al. (1993), it dwells in muddy and sandy bottoms 30-60 m deep. Former records in the Gulf of Thailand were from muddy bottoms 9-18 m deep (LYNGE, 1909 sub *Corbula tunicata*).

FOSSIL RECORDS: Late Miocene to Quaternary of Southeast Asia; Pliocene and Quaternary of Japan.

Corbula (Anisocorbula) crassa Reeve, 1843
Pl. 20, figs. 7, 8

1843a *Corbula crassa* Hinds, p. 55.
1885 *Corbula crassa* - Smith, p. 30.
1909 *Corbula (Aloidis) crassa* - Lynge, p. 265.
1932 *Corbula crassa* - Prashad, p. 309, pl. 7, figs. 5-8 .
1941 *Corbula crassa* - Lamy, p. 29.
1976a *Corbula crassa* - Nielsen, p. 7, fig. 90.
1990 *Corbula (Corbula) crassa* - Morton, p.1055-1073, figs. 1-8, 12, 14.
1991 *Anisocorbula crassa* - Lan Xiu, p. 344, pl. 13, figs. 9, 11, 12; pl. 14, figs. 7, 8.
1994 *Corbula crassa* - Scott, p. 93, pl. 14, fig. A.
1998 *Corbula (Serracorbula) crassa* - Lamprell & Healy, p. 194, fig. 564.

Corbula crassa is featured by 1) elongate, ovate-triangular shell attaining 26 mm in lenght, 2) subrostrate, obliquely truncate posterior part, 3) sharp umbonal keel, 4) posterior adductor scar on a raised platform and 5) sculpture of evenly spaced, strong, rounded commarginal ridges crossed by radial rows of exceedingly minute granules; the ridges are sharply bent on crossing the keel. PRASHAD (1932) pointed out that young shells differ greatly in outline from fully grown specimens. According to SCOTT (1994), the name *crassa* Reeve pre-dates *crassa* Hinds by two months. *Corbula macgillivrayi* Smith, 1885 is very similar in several respects, but has less attenuate posterior part and more sinuous ventral margin.

DISTRIBUTION AND HABITAT. *Corbula crassa* is distributed in the Indo-Pacific, from Andaman Sea to Australia and northward to Japan. It occurs in sandy intertidal and infralittoral bottoms (BERNARD et al., 1993). Previous records in Thai waters were from muddy, sandy, shelly or mixed substrates in the 2-36 m bathymetric interval (LYNGE, 1909; NIELSEN, 1976).

FOSSIL RECORDS: Late Miocene to Quaternary of Indonesia.

Corbula (Anisocorbula) modesta Hinds, 1843
Pl. 20, fig. 9

1843a *Corbula modesta* Hinds, p. 57.
1885 *Corbula modesta* - Smith, p. 32.
1909 *Corbula taheitensis* - Lynge, p. 269.
1932 *Aloidis modesta* - Prashad, p. 308.
1941 *Corbula modesta* - Lamy, p. 138.
1951 *Aloidis modesta* - Viader, p. 145.
1956 *Aloides modesta* - Satyamurti, p. 160, pl. 24, fig. 4.
1968 *Anisocorbula modesta* - Habe, p. 204, pl. 63, fig. 4.
1973 *Corbula modesta* - Biggs, p. 407.
1976a *Corbula modesta* - Nielsen, p. 7, fig. 85.
1977 *Anisocorbula modesta* - Habe, p. 281, pl. 59, fig. 8.
1982 *Corbula modesta* - Bosch & Bosch, p. 191, fig. in same page.
1989 *Corbula modesta* - Bosch & Bosch, p. 95, top fig.
Not 1990 *Anisocorbula modesta* - Ito, p. 128, pl. 33, fig. 9 (= *Corbula taitensis* Lamarck, 1818 ?).
1992 *Corbula (Anisocorbula) taitensis* - Oliver, p. 197, pl. 46, fig. 6.
1995 *Corbula taitensis* - Bosch, Dance, Moolenbeek & Oliver, p. 277, fig. 1251.
1998 *Corbula (Anisocorbula) taheitensis* - Lamprell & Healy, p. 190, fig. 555.

Corbula modesta is featured by 1) ovate-trigonal, solid shell up to 15 mm in lenght, 2) oblique posterior margin, 3) distinct umbonal keel, 4) sharp postero-ventral corner and 5) thick, rounded commarginal ridges bearing 1-2 fine longitudinal furrows. *Corbula taitensis* Lamarck, 1818 is closely related and differs only in that has a somewhat sharper umbonal keel and narrower, more distant commarginal ribs.

DISTRIBUTION AND HABITAT. *Corbula modesta* is distributed in the Indo-Pacific, from the Red Sea to Japan. It occurs intertidally and infralittorally in sandy bottoms (HABE, 1968; BERNARD et al., 1993). On the west coast of Malaysia and Thailand, *Anisocorbula modesta* was recovered from intertidal and subtidal sandy substrates

with rocks and coral rubble (NIELSEN, 1976; PURCHON & PURCHON, 1981; MORRIS & PURCHON, 1981).
FOSSIL RECORDS: Holocene of Thailand.

Corbula (Anisocorbula) solidula Hinds, 1843
Pl. 20, fig. 10

1843a *Corbula solidula* Hinds, p. 58.
1909 *Corbula solidula* - Lynge, p. 174, pl. 5, figs. 31-34, 42-44.
1998 *Corbula (Serracorbula) solidula* - Lamprell & Healy, p. 194, fig. 566.

Corbula solidula is characterized by 1) ovate-triangular, slightly inequivalve, inequilateral, thick shell attaining 7 mm in length, 2) anterior side oval, 3) posterior side pointed, with sharp umbonal keel, 4) ventral margin nearly straight, with weak posterior sinuation, 5) pallial sinus wanting, 6) sculpture of thick, even commarginal cords nearly as wide as the intervening furrows, somewhat stronger on the right valve; the cords bend sharply on crossing the keel and are thinner over the postero-dorsal area; the microsculpture consists of radial rows of minute granules in the furrows between the cords.
DISTRIBUTION AND HABITAT. The species is distributed in the Southwest Pacific, from New Guinea to the Gulf of Thailand and northward to Japan. *Corbula solidula* occurs in sand and mud, from the intertidal zone down to 10 m (BERNARD et al., 1993). In the Gulf of Thailand it was recorded from muddy, sandy and mixed substrates, at depths of 2-55 m (LYNGE, 1909).
FOSSIL RECORDS: Middle Miocene to Quaternary of Indonesia; Holocene of Thailand.

Corbula (Anisocorbula) sp.
Pl. 20, fig. 11

A single right valve 1.5 mm long was recovered. Diagnostic features are 1) shell tumid, slightly inequilateral, oval in outline, 2) anterior side oval, 3) posterior side vertically truncate, with sharp umbonal keel, 4) ventral margin gently arched, slightly sinuous posteriorly, forming a sharp angle with the posterior truncation, 5) pallial sinus very weak, 6) sculpture of asymmetric commarginal low ridges with narrow and steep upper slope, replaced ventrally by rounded cords; the commarginal elements bend sharply on crossing the umbonal keel and change into distant, undulating threads; umbonal area bearing only growth lines.

Corbula (Caryocorbula) lineata Lynge, 1909
Pl. 20, fig. 12

1909 *Corbula lineata* Lynge, p. 267, pl. 5, figs. 23, 24.

Distinctive features are 1) oblong, ovate-triangular, moderately inequivalve, inequilateral shell attaining 10 mm in length, 2) anterior side oval, 3) posterior side elongately triangular, rostrate, with 2 weak umbonal keels separated by a shallow and wide furrow, 4) chondrophore large, subtriangular, 5) pallial sinus small, 6) outer surface with uneven growth markings, slightly rougher over the postero-dorsal area.
DISTRIBUTION AND HABITAT. The species ranges from the Gulf of Thailand to Philippines and China Sea. It occurs in sand, from the intertidal zone to 50 m depth (BERNARD et al., 1993). Previous records in the Gulf of Thailand were from the upper infralittoral zone (LYNGE, 1909).
FOSSIL RECORDS: Holocene of Thailand.

Corbula (Notocorbula) monilis Hinds, 1843
Pl. 20, figs. 13, 14

1843a *Corbula monilis* Hinds, p. 58.
1885 *Corbula monilis* - Smith. P. 34.
1909 *Corbula monilis* - Lynge, p. 270, pl. 5, figs. 27-30.
1932 *Aloidis monilis* - Prashad, p. 307.
1941 *Corbula monilis* - Lamy, p. 222.
1998 *Corbula (Notocorbula) monilis* - Lamprell & Healy, p. 192, fig. 561.

This small corbulid is distinguished by 1) oval, globose, inequivalve and inequilateral, thick shell not exceeding 3 mm in length, 2) anterior side rounded, 3) posterior side tapering, truncate, 4) hinge with a strong cardinal tooth in the right valve, 5) chondrophore bipartite in the left valve, 6) pallial sinus wide and very shallow, 7) sculpture of coarse commarginal cords.
DISTRIBUTION AND HABITAT. The species is distributed in the Southwest Pacific, from Queensland to the Philippines. Previous records in the Gulf of Thailand were from infralittoral sand or shelly mud (LYNGE, 1909).
FOSSIL RECORDS: Upper Miocene to Quaternary of Indonesia.

Subfamily *Lentidiinae*

Lentidium ? sp.
Pl. 21, fig. 1

A single, 6 mm long specimen featured by 1) elongate-oval, moderately inequivalve, subequilateral, somewhat *Tellina*-like shell, 2) anterior side oval, more tapering than the posterior one which is obliquely subtruncate, 3) weak posterior ridge, 4) chondrophore projecting, divided into 2 lobes, 5) pallial sinus broad and shallow, with oblique upper border, 6) outer surface shining, with commarginal growth lines. The present unidentified species closely resembles *Lentidium mediterraneum* (Costa, 1829) and is assigned with much hesitation to the genus *Lentidium* De Cristofori & Jan, 1832 which is so far known only from the Mediterranean Sea.

Superfamily GASTROCHAENOIDEA
Family *GASTROCHAENIDAE*

Gastrochaena (Gastrochaena) cuneiformis Spengler, 1783
Pl. 21, fig. 2

1909 *Gastrochaena gigantea* - Lynge, p. 280.
1923 *Gastrochaena cuneiformis* - Lamy, p. 391-393.
1960 *Gastrochaena cuneiformis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 227, fig. 190.
1965 *Gastrochaena cuneiformis* - Kira, p. 182, pl. 63, fig. 14.
1969 *Gastrochaena (Gastrochaena) cuneiformis* - Treatise I. P., p. N699, fig. E160 (5).
1973 *Gastrochaena cuneiformis* - Selli, p. 251.
1976a *Gastrochaena cuneiformis* - Nielsen, p. 7, fig. 88.
1977 *Gastrochaena (Gastrochaena) cuneiformis* - Habe, p. 287, pl. 60, figs. 5, 6.
1979 *Gastrochaena cuneiformis* - Tantanasiriwong, p. 14.
1979 *Gastro chaena (Rocellaria) cuneiformis* - Kay, p. 570, fig. 185A.
1982 *Gastrochaena cuneiformis* - Abbott & Dance, p. 370, fig. in lower mid row, left.
1984 *Gastrochaena cuneiformis* - Sharabati, pl. 48, figs. 14, 14a.
1984 *Gastrochaena cuneiformis* - Matsukuma, p. 28, pl. 5, fig. 19.
1986 *Gastrochaena gigantea* - Nielsen, p. 13, figs. 4C, 5C.
1988 *Gastrochaena cuneiformis* - Drivas & Jay, p. 138, pl. 54, fig. 11.
1992 *Gastrochaena gigantea* - Oliver, p. 199, pl. 45, fig. 7.
1995 *Gastrochaena gigantea* - Bosch, Dance, Moolenbeek & Oliver, p. 278, fig. 1255.
1995 *Gastrochaena cuneiformis* - Kubo & Kurozumi, p. 205, top fig., fig. 1.
1998 *Gastrochaena (Gastrochaena) cuneiformis* - Lamprell & Healy, p. 196, fig. 570.

Distinctive features are 1) elongate, triangular to quadrangular, markedly inequilateral, distorted, widely gaping shell up to 40

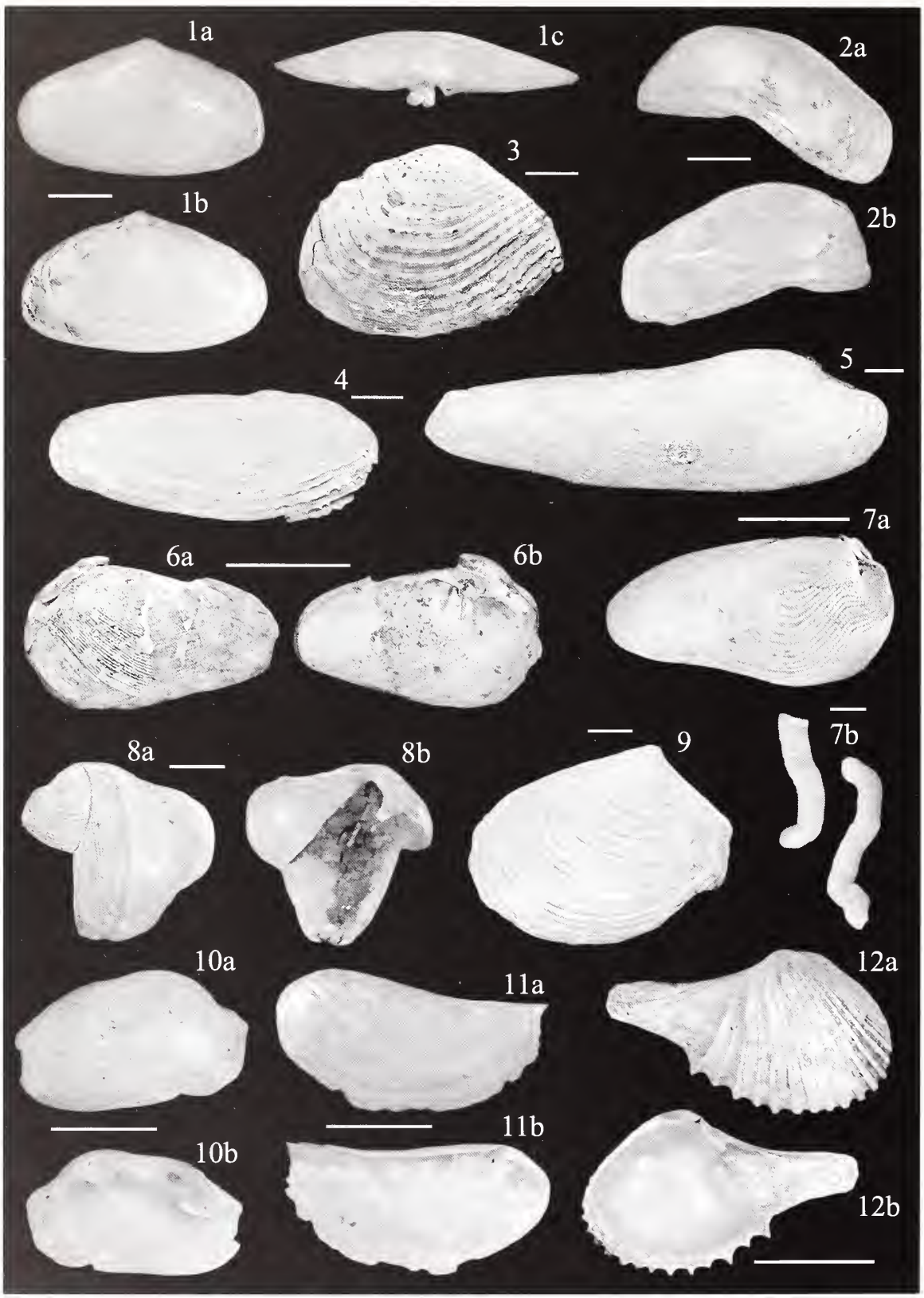

Plate 21: Figs. 1a, 1b, 1c. *Lentidium ?* sp., Station TH 39; scale bar 2 mm. Figs. 2a, 2b. *Gastrochaena (Gastrochaena) cuneiformis* Spengler, 1783, Station TH 108; scale bar 2 mm. Fig. 3. *Barnea (Anchomasa) dilatata* (Souleyet, 1843), Senanivate, Quarry 1, level 6-7 m, Holocene; scale bar 10 mm. Fig. 4. *Barnea (Anchomasa) manilensis* (Philippi, 1847), Station TH 75; scale bar 10 mm. Fig. 5. *Pholas (Monothyra) orientalis* Gmelin, 1791, sand spit near Ban Laem Phak Bia; scale bar 10 mm. Figs. 6a, 6b. *Martesia (Martesia) striata* (Linnaeus, 1758), Station TH 76; scale bar 5 mm. Figs. 7a, 7b. *Pholadidea* sp., Wat Hoi, Holocene; scale bar 5 mm. Figs. 8a, 8b. *Teredinidae* sp., Station TH 29; scale bar 1 mm. Fig. 9. *Periploma (Periploma) indicum* Melvill, 1898, Station TH 84; scale bar 1 mm. Figs. 10a, 10b. *Agriodesma navicula* (Adams & Reeve, 1850), Locality TH 42, Holocene; scale bar 0.5 mm. Figs. 11a, 11b. *Pandora (Frenamya) elongata* (Carpenter, 1864), Station TH 82; scale bar 0.5 mm. Figs. 12a, 12b. *Cardiomya (Cardiomya) singaporensis* (Hinds, 1843), Station TH 108; scale bar 0.5 mm.

mm in length, 2) beaks close to the anterior end, 3) hinge edentulous, 4) outer surface with uneven growth markings.

DISTRIBUTION AND HABITAT. The species occurs commonly in the tropical Indo-Pacific. It is a rock and dead coral borer distributed from the intertidal zone down to 25 m depth (BERNARD et al., 1993). Previous records in the Gulf of Thailand (LYNGE, 1909) fit in with the above bathymetric range.

FOSSIL RECORDS: Quaternary of East Africa.

Superfamily PHOLADOIDEA
Family *PHOLADIDAE*
Subfamily *Pholadinae*

Barnea (Anchomasa) dilatata (Souleyet, 1843)
Pl. 21, fig. 3

1850 *Pholas latissima* - Philippi, p. 127, pl. 2, fig. 1.
1925 *Barnea (Cyrtopleura) dilatata* - Lamy, p. 90.
1927 *Pholas latissima* - Van der Meer Mohr, p. 207, pl. 2, fig. 1.
1960 *Barnea (Cyrtopleura) dilatata* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 236, fig. 196.
1964 *Pholas (Zirphaea) patula* - Johnson, p. 123, pl. 25, fig. 2.
1965 *Barnea (Umitakea) dilatata japonica* - Kira, p. 184, pl. 63, fig. 22.
1977 *Barnea (Umitakea) dilatata* - Habe, p. 290, pl. 61, figs. 2-4.
1984 *Barnea (Anchomasa) patula* - Dheeradilok, Chaimanee, Piccoli & Robba, p. 418, pl. 3, fig. 4.
1986 *Barnea (Umitakea) dilatata* - Springsteen & Leobrera, p. 310, pl. 88, fig. 8.
1991 *Barnea dilatata* - Abbott, p. 103, pl. 50, fig. 5.
1991 *Barnea (Cyrtopleura) dilatata* - Lan Xiu, p. 346, pl. 14, fig. 1.
1998 *Barnea (Anchomasa) latissima* - Lamprell & Healy, p. 200, fig. 582.

The species is featured by 1) subquadrangular, nearly equivalve, inequilateral, thin shell up to 86 mm in length, 2) anterior side quickly tapering, subangular, 3) posterior side quadrangular, vertically truncated and widely gaping, 4) ventral margin nearly straight, then steeply ascending anteriorly, 5) sculpture of widely spaced commarginal ridges and radial riblets that form pointed nodes on crossing the ridges; the posterior one-third bears attenuated ridges and is devoid of ribs.

DISTRIBUTION AND HABITAT. *Barnea dilatata* ranges from the Bay of Bengal to Australia and northward to Japan. It is mud and sand burrower occurring intertidally and down to 20 m depth (KIRA, 1965; BERNARD et al., 1993). On the west coast of Thailand, it was observed to burrow in mud flats below low water mark (TANTANASIRIWONG, 1979).

FOSSIL RECORDS: Pliocene of Indonesia and Taiwan; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Barnea (Anchomasa) manilensis (Philippi, 1847)
Pl. 21, fig. 4

1849 *Pholas manilensis* - Philippi, p. 51, pl. 1, fig. 2.
1954 *Barnea (Anchomasa) inornata* - Taki & Oyama, pl. 7, fig. 29.
1960 *Barnea (Anchomasa)fragilis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 233, fig. 194.
1965 *Barnea (Anchomasa) manilensis* - Kira, p. 184, pl. 63, fig. 23.
1968 *Barnea (Anchomasa) manilensis* forma *inornata* - Habe, p. 206, pl. 63, fig. 16.
1971 *Barnea (Anchomasa) manilensis inornata* - Kuroda, Habe & Oyama, p. 469, pl. 102, fig. 6.
1977 *Barnea (Anchomasa) manilensis* - Habe, p. 289, pl. 61, figs. 1, 5-8.
1980 *Barnea manilensis inornata* - Volova & Scarlato, p. 89, fig. 90.
1981 *Barnea manilensis* - Eisenberg, p. 173, pl. 155, fig. 22.
1981 *Barnea manilensis* - Richards, p. 90, pl. 59, fig. 521.
1985 *Barnea manilensis* - Morton, p. 191, fig. 1.
1988 *Barnea (Anchomasa) manilensis* - Yoon, pl. 2, fig. 13.
1993 *Barnea (Anchomasa) manilensis* - Noda, Kikuchi & Nikaido, p. 165, fig. 14 (9-12).
Not 1995 *Barnea manillensis* - Bosch, Dance, Moolenbeek & Oliver, p. 279, fig. 1261.
1995 *Barnea manilensis* - Kubo & Kurozumi, p. 204, top fig, fig. 1.

Barnea manilensis is featured by 1) elongate-elliptical, gaping at both ends, subequivalve, markedly inequilateral, thin shell up to 75 mm in length, 2) angular anterior edge, 3) ventral margin with distinct anterior sinuation, 4) protoplax lanceolate, 5) outer surface with distant commarginal lamellae that bear short reclining spines arranged into radial rows; the posterior one-third has only growth markings; some faint radial riblets and a microsculpture of oblique threads are also noted.

DISTRIBUTION AND HABITAT. The species is reported to range from Philippines to Japan. It is a rock and clay borer occurring intertidally and down to 20 m depth (KIRA, 1965; BERNARD et al., 1993).

FOSSIL RECORDS: Pliocene of Japan and Korea; Quaternary of Japan.

Pholas (Monothyra) orientalis Gmelin, 1791
Pl. 21, fig. 5

1909 *Pholas (Monothyra) orientalis* - Lynge, p. 282.
1923 a *Pholas orientalis* - Van der Meer Mohr, p. 126, pl. 1, figs. 15, 16.
1923 b *Pholas orientalis* - Van der Meer Mohr, p. 210, pl. 9, figs. 1, 2.
1956 *Pholas (Monothyra) orientalis* - Satyamurti, p. 167, pl. 25, fig. 1.
1960 *Pholas (Monothyra) orientalis* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 230, fig. 192.
1968 *Phoas (Monothyra) orientalis* - Cheriyan, p. 135.
1969 *Pholas (Monothyra) orientalis* - Treatise I. P., p. 708, fig. E167 (1).
1982 *Pholas orientalis* - Abbott & Dance, p. 378, fig. in top row, middle left.
1986 *Monothyra orientalis* - Springsteen & Leobrera, p. 312, pl. 88, fig. 10.
1991 *Pholas orientalis* - Abbott, p. 103, pl. 50, fig. 4.
1992 *Pholas orientalis* - Dharma, p. 96, pl. 26, fig. 20.
1998 *Pholas (Monothyra) orientalis* - Lamprell & Healy, p. 198, fig. 580.

Pholas orientalis is characterized by 1) very elongate, elliptical, subequivalve, markedly inequilateral, gaping at both ends, thin shell up to 125 mm in length, 2) protoplax in one piece, shield-like, 3) sculpture of radial rows of small nodes over the anterior half; posterior part with dense commarginal growth markings.

DISTRIBUTION AND HABITAT. The species ranges form Indonesia to South China Sea. It dwells in stiff clayey bottoms, from the intertidal zone down to 20 m depth (BERNARD et al., 1993). *Pholas orientalis* was recovered from intertidal sand and rocks in Malayan and Singapore waters (PURCHON & PURCHON, 1981).

FOSSIL RECORDS: Middle and Upper Miocene of Myanmar; Pliocene of Indonesia; Quaternary of the Indo-Pacific area; Holocene of Thailand.

Subfamily *Martesiinae*

Martesia (Martesia) striata (Linnaeus, 1758)
Pl. 21, fig. 6

1858 *Martesia striata* - Adams & Adams, p. 330, pl. 90, figs. 5, 5a.
1885 *Martesia striata* - Smith, p. 27.
1906 *Martesia striata* - Melvill & Standen, p. 845.
1909 *Pholas (Martesia) striata* - Lynge, p. 283.
1946 *Martesia striata* - Abrard, p. 46, pl. 4, fig. 6.
1956 *Martesia striata* - Satyamurti, p. 168, pl. 25, fig. 2.
1958 *Martesia striata* - Keen, p. 216, fig. 550.
1960 *Martesia striata* - Thang Xi, Qi Zhongyan, Li Jiemin, Ma Xiutong, Wang Zhenrui, Huang Xiuming & Zhuang Qiquian, p. 240, fig. 200.
1964 *Martesia striata* - Spry, p. 40.

1965 *Martesia striata* - Kira, p. 183, pl. 63, fig. 16.
1968 *Martesia striata* - Cheriyan, p. 134.
1968 *Martesia (Martesia) striata* - Subba Rao, p. 92.
1969 *Martesia (Martesia) striata* - Treatise I. P., p. N712, figs. E176 (2), E177 (1).
1977 *Martesia striata* - Habe, p. 291, pl. 61, figs. 11-14.
1978 *Martesia striata* - Cernohorsky, p. 188, pl. 68, fig. 4.
1979 *Martesia striata* - Kay, p. 573, fig. 185 C.
1982 *Martesia striata* - Abbott & Dance, p. 372, fig. in top row, right.
1986 *Martesia striata* - Springsteen & Leobrera, p. 312, pl. 88, fig. 9.
1992 *Martesia striata* - Oliver, p. 203, pl. 45, fig. 4 (*cum syn.*).
1995 *Martesia striata* - Bosch, Dance, Moolenbeek & Oliver, p. 279, fig. 1263.
1998 *Martesia (Martesia) striata* - Lamprell & Healy, p. 200, fig. 584.

The species is recognized by 1) elongate-oval, markedly inequilateral shell attaining 63 mm in length, 2) anterior part globose, 3) posterior part attenuate, with obtusely rounded edge, straight-sided in dorsal view 4) well developed pedal gape filled with large callum, 5) outer surface with a radial groove at the anterior one-third, 6) sculpture of commarginal ridges that are minutely nodose anterior to the radial groove, with nodes arranged into radial rows.

DISTRIBUTION AND HABITAT. *Martesia striata* is cosmopolitan in warm seas. It occurs intertidally and in shallow water, boring in timber (BERNARD et al., 1993). In the Gulf of Thailand, *Martesia striata* was recovered in floating coconuts and fruits of *Terminalia catappa* (LYNGE, 1909).

FOSSIL RECORDS: Middle Miocene of Japan; Upper Miocene of Indonesia; Pliocene of the New Hebrides; Holocene of Thailand.

Pholadidea sp.
Pl. 21, fig. 7

Several small-sized specimens featured by 1) elongate-oval, strongly inequilateral shell attaining 11 mm in length, 2) pedal gape filled with callus extending dorsally over beaks to form a raised umbonal reflection, 3) mesoplax divided longitudinally into two triangular plates, 4) distinct umbonal-ventral sulcus, 5) apophyses arched, of constant width, ending approximately at the same level of the condrophore, 6) ventral adductor scar narrow, very long, overriding the umbonal-ventral ridge, 7) outer surface with commarginal, undulating, crowded lamellae anterior to the umbonal-ventral sulcus, forming an acute angle with this latter; mid-posterior part with commarginal fine cords and growth lines perpendicular to the sulcus.

DISTRIBUTION AND HABITAT. *Pholadidea* species are shale, soft rock and coral-borers. The present fossil specimens were borers into large shells of *Crassostrea gigas*.

FOSSIL RECORDS: Holocene of Thailand.

Family *TEREDINIDAE*

Teredinidae sp.
Pl. 21, fig. 8

A single 3.5 mm long valve that cannot be assigned safely to species in the absence of pallets. Teredinids occur in shallow water, boring in timber.

Subclass ANOMALODESMATA
Superfamily PANDOROIDEA
Family *PERIPLOMATIDAE*

Periploma (Periploma) indicum Melvill, 1898
Pl. 21, fig. 9

1995 *Periploma indicum* - Bosch, Dance, Moolenbeek & Oliver, p. 281, fig. 1268.

Diagnostic features are 1) oval, tellinid in shape, inequivalve and inequilateral, thin shell attaining 20 mm in length, 2) beaks behind mid-length, 3) anterior side oval, 4) posterior side attenuate, truncate, with weak umbonal ridge, 5) condrophore truncate anteriorly, 6) pallial sinus oval extending to the level of beaks, 7) outer surface with low commarginal ridges; microsculpture of minute granules arranged in irregular radial rows except for the postero-dorsal area that bears thin, undulating lamellae. According to the figure of *Periploma plane* Ozaki, 1958 published by HABE (1977; pl. 65, figs. 6, 7), this species differs in having rounded posterior side at least.

DISTRIBUTION AND HABITAT. The species was described from the Indian Ocean. It is reported to be a mud dweller occurring offshore.

FOSSIL RECORDS: Holocene of Thailand.

Family *LYONSIIDAE*

Agriodesma navicula (Adams & Reeve, 1850)
Pl. 21, fig. 10

1952b *Entodesma naviculoides* - Habe, p. 155, pl. 22, figs. 5, 6.
1952b *Entodesma navicula* - Habe, p. 155, pl. 22, fig. 9.
1954 *Entodesma naviculoides* - Taki & Oyama, pl. 26, fig. 11.
1965 *Entodesma navicula* - Kira, p. 179, pl. 62, fig. 20.
1965 *Entodesma naviculoides* - Kira, p. 179, pl. 62, fig. 21.
1971 *Agriodesma navicula* - Kuroda, Habe & Oyama, p. 478, pl. 103, fig. 17.
1977 *Agriodesma navicula* form naviculoides - Habe, p. 306, pl. 64, figs. 9, 10.
1977 *Agriodesma navicula* - Habe, p. 306, pl. 64, fig. 11.
1980 *Entodesma naviculoides* - Volova & Scarlato, p. 42, fig. 34.
1983 *Agriodesma naviculum* - Masuda, Hayasaka & Noda, p. 22.

The species is featured by 1) ovate-quadrangular to irregularly shaped, inequivalve and inequilateral shell that may attain 70 mm in length, 2) distinct postero-dorsal angulation, 3) ventral margin with anterior sinuation, 4) resilifer triangular, large, just posterior to beaks, 5) adductor scars nearly touching the dorsal margin, 6) outer surface with coarse, uneven growth markings and fine radial threads over the middle part.

DISTRIBUTION AND HABITAT. *Agriodesma navicula* ranges from Indonesia to Japan. It is a rock borer occurring intertidally and down to 85 m depth (KURODA et al., 1971; BERNARD et al., 1993).

FOSSIL RECORDS: Quaternary of Japan; Holocene of Thailand.

Family *PANDORIDAE*

Pandora (Frenamya) elongata (Carpenter, 1864)
Pl. 21, fig. 11

1885 *Coelodon elongatus* - Smith, p. 62.
1909 *Coelodon elongatus* - Lynge, p. 287.
1932 *Calopodium (Coelodon) elongatum* - Prashad, p. 322.
1998 *Pandora (Frenamya) elongatus* - Lamprell & Healy, p. 216, fig. 628.

The species is featured by 1) elongate, markedly inequilateral, thin shell attaining 16 mm in length, 2) antero-dorsal margin very short, straight and quickly slanting, 3) postero-dorsal margin long and concave, 4) posterior side subrostrate, with 2 thin but distinct radial ridges close to the dorsal margin, 5) laminae connected by a triangular plate in left valve, 6) outer surface shining, with distant commarginal low folds and obscure radial wrinkles anteriorly.

DISTRIBUTION AND HABITAT. *Pandora elongata* ranges from Australia to South China Sea. According to BERNARD et al. (1993), it occurs in mud, from 20 to 80 m depth. Previous records in the

Gulf of Thailand were from clayey mud 9 m deep (LYNGE, 1909).
FOSSIL RECORDS: none recorded.

Superfamily POROMYOIDEA
Family *CUSPIDARIIDAE*

Cardiomya (Cardiomya) singaporensis (Hinds, 1843)
Pl. 21, fig. 12

1843b *Neaera singaporensis* Hinds, p. 77.
1909 *Neaera singaporensis* - Lynge, p. 288, text-fig. p. 289.
1932 *Cuspidaria (Cardiomya) singaporensis* - Prashad, p. 332.
1995 *Cardiomya singaporensis* - Scott, p. 50, bottom fig., left.

Cardiomya singaporensis is featured by 1) small, ovate-triangular, inflated and strongly rostrated shell. 2) 18-21 radial ribs relatively strong and rounded except for those on the antero-dorsal part which are thinner or subobsolescent and 3) rostrum with 3 riblets. The Red Sea *Cardiomya pulchella* (Adams, 1871) appears to be the most closely related species differing only in having a shorter rostrum and 15-18 ribs. *Cardiomya gouldiana* (Hinds, 1843) is also related but differs in that has the rostrum devoid of riblets.
DISTRIBUTION AND HABITAT. The species is distributed from Malaysia to South China Sea. It dwells on sandy or muddy bottoms in the 10-200 m bathymetric range (LYNGE, 1909; BERNARD et al., 1993). Records in the Gulf of Thailand were from predominantly muddy substrates 10-70 m deep (LYNGE, 1909; SCOTT, 1995).
FOSSIL RECORDS: none recorded.

APPENDIX - List of species; HBC, recovered only from the Holocene Bangkok Clay; R, recovered only from modern environments. In the absence of specific indication, the species is to be intended as occurring as both fossil and Recent.

Species	HBC	R
Nucula (Nucula) sp.		
Nuculoma layardi (Adams, 1856)		
Nuculana (Jupiteria) puellata (Hinds, 1843)		
Nuculana (Scaeoleda) cuspidata (Gould, 1861)		
Yoldia (Yoldia) belcheri (Hinds, 1843)		
Portlandia japonica (Adams & Reeve, 1850)		*
Arca (Arca) navicularis Bruguière, 1789		*
Arca (Arca) sp.		*
Barbatia (Barbatia) foliata (Forsskål, 1775)		*
Barbatia (Barbatia) signata (Dunker, 1868)		*
Hawaiarca bistrigata (Dunker, 1853)		
Trisidos semitorta (Lamarck, 1819)		*
Trisidos tortuosa (Linnaeus, 1758)		
Anadara ferruginea (Reeve, 1844)		
Anadara granosa (Linnaeus, 1758)		
Anadara oblonga (Philippi, 1849)		
Anadara sp.	*	
Scapharca crebricostata (Reeve, 1844)		*
Scapharca inaequivalvis (Bruguière, 1789)		
Scapharca indica (Gmelin, 1791)		
Sheldonella lateralis (Reeve, 1844)		*
Striarca symmetrica (Reeve, 1844)		
Didimacar tenebrica (Reeve, 1844)		
Estellacar olivacea (Reeve, 1844)		
Scelidionarca pectunculiformis (Dunker, 1866)	*	
Verilarca (Verilarca) sinensis (Thiele & Jaeckel, 1931)		
Verilarca (Spinearca) mortenseni (Lynge, 1909)		*
Cucullaea labiata (Lightfoot, 1786)		*
Perna viridis (Linnaeus, 1758)		*
Septifer bilocularis (Linnaeus, 1758)		*
Modiolus (Modiolus) elongatus (Swainson, 1821)		*
Modiolus (Modiolus) metcalfei (Hanley, 1843)		*
Modiolus (Modiolus) philippinarum (Hanley, 1844)		
Modiolus (Modiolus) plumescens (Dunker, 1868)		
Arcuatula arcuatula (Hanley, 1843)		
Botula cinnamomea (Gmelin, 1791)		*
Musculista japonica (Dunker, 1856)		*
Musculista senhousia (Benson, 1842)		*
Pteria brevialata (Dunker, 1872)		*
Pinctada radiata (Leach, 1814)		*
Malleus (Malleus) albus Lamarck, 1819		*
Malleus (Malvufundus) regula (Forsskål, 1775)		*
Vulsella vulsella (Linnaeus, 1758)	*	
Isognomon isognomum (Linnaeus, 1758)		*
Pinna bicolor Gmelin, 1791		*
Atrina (Atrina) vexillum (Born, 1778)		*

Species	HBC	R
Atrina (Servatrina) pectinata (Linnaeus, 1767)		
Limaria (Limaria) basilanica (Adams & Reeve, 1850)		
Limaria (Limaria) fragilis (Gmelin, 1791)		
Ostrea (Ostrea) denselamellosa Lischke, 1869		*
Planostrea pestigris (Hanley, 1845)		
Crassostrea gigas (Thunberg, 1793)	*	
Saccostrea cucullata (Born, 1778)		
Alectryonella haliotidaea (Lamarck, 1819)		*
Dendostrea folium (Linnaeus, 1758)		
Dendostrea rosacea (Deshayes, 1836)		
Hyotissa hyotis (Linnaeus, 1758)	*	
Plicatula (Plicatula) chinensis Mörch, 1853		
Plicatula (Plicatula) muricata Sowerby, 1873	*	
Chlamys (Chlamys) senatoria (Gmelin, 1791)	*	
Chlamys (Argopecten) pelseneeri (Dautzenberg & Bavay, 1912)		
Minnivola pyxidata (Born, 1778)	*	
Spondylus barbatus Reeve, 1856		*
Spondylus nicobaricus Schreibers, 1793		*
Anomia aculeus Gray, 1850	*	
Anomia chinensis Philippi, 1848		*
Placuna placenta (Linnaeus, 1758)		
Codakia sp.	*	
Loripes (Loripes) desideratus (Smith, 1885)		*
Lucina (Lucinisca) venusta Philippi, 1847		
Parvilucina (Bellucina) semperiana (Issel, 1869)		
Parvilucina (Parvilucina) pulchella (Lynge, 1909)		*
Pillucina pisidium (Dunker, 1860)		
Anodontia (Anodontia) edentula (Linnaeus, 1758)		
Eamesiella corrugata (Deshayes, 1843)	*	
Cycladicama oblonga (Hanley, 1844)		
Felaniella (Zemysia) conspicua (Smith, 1885)		
Phlyctiderma amboinense (Smith, 1885)		
Phlyctiderma japonicum (Pilsbry, 1895)		*
Leiochasmea sp.		*
Kellia laperousii Deshayes, 1839		*
Kellia porculus Pilsbry, 1904		*
Kellia sp. 1		
Kellia sp. 2		
Kellia sp. 3		
Marikellia elongata (Lynge, 1909)		*
Pseudopythina arakensis (Habe, 1959)		*
Pseudopythina venusta (Lynge, 1909)		*
Pseudopythina sp.		
Scintillula sp.		
Melliteryx puncticulata (Yokoyama, 1924)		
Parvikellia sp.		

Species	HBC	R
"Erycina" lineata (Lynge, 1909)		*
Erycininae sp.		*
Callomysia matsui Habe, 1951		*
Curvemysella arcuata (Adams, 1856)	*	
Curvemysella paula (Adams, 1856)		
Fronsella sp.		
Tellimya sp. 1		
Tellimya sp. 2		
Mysella costata (Lynge, 1909)		
Mysella mutsuwanensis (Yamamoto & Habe, 1959)		*
Mysella rudis (Lynge, 1909)		
Mysella variabilis (Lynge, 1909)		
Mysella sp. 1		
Mysella sp. 2		*
Mysella sp. 3		
Mysella sp. 4		*
Mysella sp. 5		*
Carditella (Carditellona) pulchella Lynge, 1909		*
Choniocardia (Carditellopsis) pusilla (Lynge, 1909)		*
Chama asperella Lamarck, 1819		
Pseudochama scutulina Poutiers, 1981		*
Bathytormus radiatus (Sowerby, 1825)		
Vepricardium coronatum (Spengler, 1799)		
Vepricardium sinense (Sowerby, 1840)		
Acrosterigma impolitum (Sowerby, 1840)		*
Afrocardium richardi (Audouin, 1826)		*
Fulvia hungerfordi (Sowerby, 1901)		
Mactra (Mactra) luzonica Deshayes, 1854		
Mactra (Mactra) violacea Gmelin, 1791		*
Mactra sp.		*
Lutraria (Lutrophora) complanata (Gmelin, 1791)	*	
Heterocardia gibbosula Deshayes, 1854		
Meropesta pellucida (Gmelin, 1791)		
Raeta (Raetellops) pulchella (Adams & Reeve, 1850)		
Solen corneus Lamarck, 1818		
Solen sp.	*	
Cultellus lacteus (Spengler, 1794)		
Siliqua minima (Gmelin, 1791)		
Tellina (Angulus) emarginatus (Sowerby, 1825)		
Tellina (Angulus) vestalis Hanley, 1844		
Tellina (Arcopella) casta Hanley, 1844		*
Tellina (Cadella) semen Hanley, 1844		
Tellina (Clathrotellina) carnicolor Hanley, 1846		*
Tellina (Macomona) australis Deshayes, 1854		
Tellina (Moerella) nitens Deshayes, 1854		
Tellina (Moerella) pallidula Lischke, 1871		
Tellina (Moerella) valtonis Hanley, 1844		
Tellina (Pinguitellina) pinguis Hanley, 1844		
Tellina (Semelangulus) sp.		*
Tellina (Serratina) capsoides Lamarck, 1818		
Tellina (Tellinangulus) aethiopica Thiele & Jaeckel, 1931		
Tellina (Tellinides) timorensis Lamarck, 1818		
Tellina (Tellinides) vernalis Hanley, 1844	*	
Tellina (Tellinides) sp.		
Arcopagia pudica (Hanley, 1844)		
Arcopagia yemenensis (Melvill, 1898)		
Dallitellina spengleri (Gmelin, 1791)	*	
Macoma (Pinguimacoma) cygnus (Hanley, 1844)		
Macoma (Pinguimacoma) languida (Smith, 1885)		
Macoma (Pinguimacoma) sp.	*	
Macoma (Psammacoma) fallax Bertin, 1878		
Exotica (Exotica) sp.		
Psammotreta (Psendometis) praerupta (Salisbury, 1934)		
Psammotreta (Tellinimactra) edentula (Spengler, 1798)		
Pulvinus micans (Hanley, 1844)		*
Semele carnicolor (Hanley, 1847)		*
Semele sinensis Adams, 1853		

Species	HBC	R
Iacra sp.	*	
Leptomya sp.		
Theora (Theora) lata (Hinds, 1843)		
Gari (Gari) simplex (Sowerby, 1894)		
Gari (Psammotaena) elongata (Lamarck, 1818)		*
Soletellina diphos (Linnaeus, 1771)	*	
Solecurtus exaratus (Philippi, 1849)		
Azorinus abbreviatus (Gould, 1861)	*	
Donax faba Gmelin, 1791		*
Donax incarnatus Gmelin, 1791		
Donax nitidus Deshayes, 1854		
Donax semigranosus Dunker, 1877		
Donax ticaonicus Hanley, 1845	*	
Alveinus ojianus (Yokoyama, 1927)		
Polymesoda (Geloina) bengalensis (Lamarck, 1818)	*	
Periglypta puerpera (Linnaeus, 1771)		*
Gafrarium dispar (Dillwyn, 1817)		*
Dorisca melvilli (Lynge, 1909)		*
Sunetta (Cyclosunetta) contempta Smith, 1891		
Anomalocardia (Anomalodiscus) squamosa (Linnaeus, 1758)		*
Placamen calophylla (Philippi, 1836)		
Placamen chloroticum (Philippi, 1849)	*	
Timoclea (Timoclea) lionota (Smith, 1885)		*
Timoclea (Timoclea) siamensis (Lynge, 1909)		*
Timoclea (Chioneryx) scabra (Hanley, 1844)		
Meretrix meretrix (Linnaeus, 1758)		
Pitar (Costellipitar) manillae (Sowerby, 1851)		*
Pitar (Pitarina) striatus (Gray, 1838)		
Lioconcha (Lioconcha) fastigiata (Sowerby, 1851)		
Lioconcha (Sulcilioconcha) philippinarum (Hanley, 1844)		
Lioconcha (Sulcilioconcha) sp.	*	
Irus (Irus) macrophyllus (Deshayes, 1853)		
Marcia hiantina (Lamarck, 1818)		
Marcia recens (Dillwyn, 1817)		
Paphia (Paphia) undulata (Born, 1778)		
Paphia (Protapes) gallus (Gmelin, 1791)		
Dosinia cretacea (Reeve, 1850)		
Dosinia dautzenbergi Fischer-Piette & Delmas, 1967		
Dosinia deropta Römer, 1860		
Dosinia dilecta Adams, 1855		
Dosinia trailli Adams, 1855		
Dosinia trigona (Reeve, *1850)*		
Dosinia tumida (Gray, 1838)		
Glauconome chinensis Gray, 1828		*
Glauconome sp.	*	
Cryptomya (Venatomya) sp.		
Sphenia perversa Blanford, 1867		*
Corbula (Corbula) fortisulcata (Smith, 1878)	*	
Corbula (Corbula) scaphoides Hinds, 1843		
Corbula (Anisocorbula) crassa Reeve, 1843		*
Corbula (Anisocorbula) modesta Hinds, 1843		
Corbula (Anisocorbula) solidula Hinds, 1843		
Corbula (Anisocorbula) sp.		*
Corbula (Caryocorbula) lineata Lynge, 1909		
Corbula (Notocorbula) monilis Hinds, 1843		*
Lentidium ? sp.		*
Gastrochaena (Gastrochaena) cuneiformis Spengler, 1783		*
Barnea (Anchomasa) dilatata (Souleyet, 1843)	*	
Barnea (Anchomasa) manilensis (Philippi, 1847)		*
Pholas (Monothyra) orientalis Gmelin, 1791		
Martesia (Martesia) striata (Linnaeus, 1758)		
Pholadidea sp.	*	
Teredinidae sp.		*
Periploma (Periploma) indicum Melvill, 1898		
Agriodesma navicula (Adams & Reeve, 1850)	*	
Pandora (Frenamya) elongata (Carpenter, 1864)		*
Cardiomya (Cardiomya) singaporensis (Hinds, 1843)		*

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